

Mining

CONGRESS JOURNAL



FEBRUARY
1955



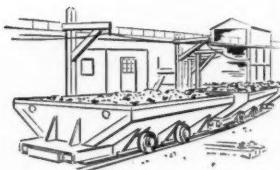
ANNUAL MINING REVIEW

1 - 1 = 0
20 - 1 = 19

it's simple arithmetic

Figure it out for yourself! ONE BIG haulage system completely shutdown by one small repair job equals zero production capacity. TWENTY Q C F Constant Haulage Mine Cars affected by one small repair job still leaves you 95% capacity. The damaged car is simply switched to a siding and the rest of the load moves on!

Why not call in your nearby Q C F Representative and get all the facts about the shutdown-proof, nonstop-unloading Q C F Constant Haulage mine car system? Q C F Industries, Incorporated, New York • Chicago • St. Louis • Cleveland • Washington • Philadelphia • San Francisco • Huntington, W. Va. • Berwick, Pa.



More Wheel Milage!

Ask for the facts about our NEW "LOAD SUPPORT" MINE CAR WHEELS that stop tread splitting "break-offs," "flats" and "load-lifting" .. deliver more milage.



acf **MINE CARS**
for Constant Haulage

Over A Million Yards of Tough Digging with ONE Tiger Brand Hoist Rope

IT GULPS DIRT BY THE CARLOAD. The Green Hornet—a 50-cu. yd. electric coal stripping shovel—must operate continuously day and night to justify its expensive existence. The long service life of Tiger Brand Hoist Rope helps keep this goliath on the job with few interruptions or delays.



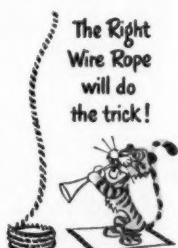
THE first Tiger Brand Hoist Rope installed on this coal stripping shovel worked 65 shifts in 23 days before it was replaced. It moved 1,161,155 cu. yds. of overburden in those three weeks.

That's good service in a punishing coal stripping operation. This big 50-cu. yd. shovel is busy every hour of the day and night, stripping overburden for Hanna Coal Company at Georgetown, Ohio. It averages as high as 54,000 yards a day. Its hoist rope really has to be rugged to work at that clip. The first Tiger Brand Rope worked so well that an identical Tiger Brand Hoist Rope replaced it.

This is not a unique case. We know of many Tiger Brand Ropes on heavy-duty earth moving equipment that have moved a million or more yards before replacement. In cases of easier digging, service in excess of 2,000,000 cubic yards is not

unusual. On any job, the correct Tiger Brand Rope gives you the longest possible service . . . steady, rope-after-rope performance that keeps down costs.

Send the coupon for more information on Tiger Brand Wire Ropes.



FREE ROPE BOOKLET

American Steel & Wire
Dept. N-25, Rockefeller Building
Cleveland 13, Ohio

Please send me, without obligation, a copy of your helpful wire rope selection guide, "The Right Rope for the Job."

Name

Company

Address

City & State

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO

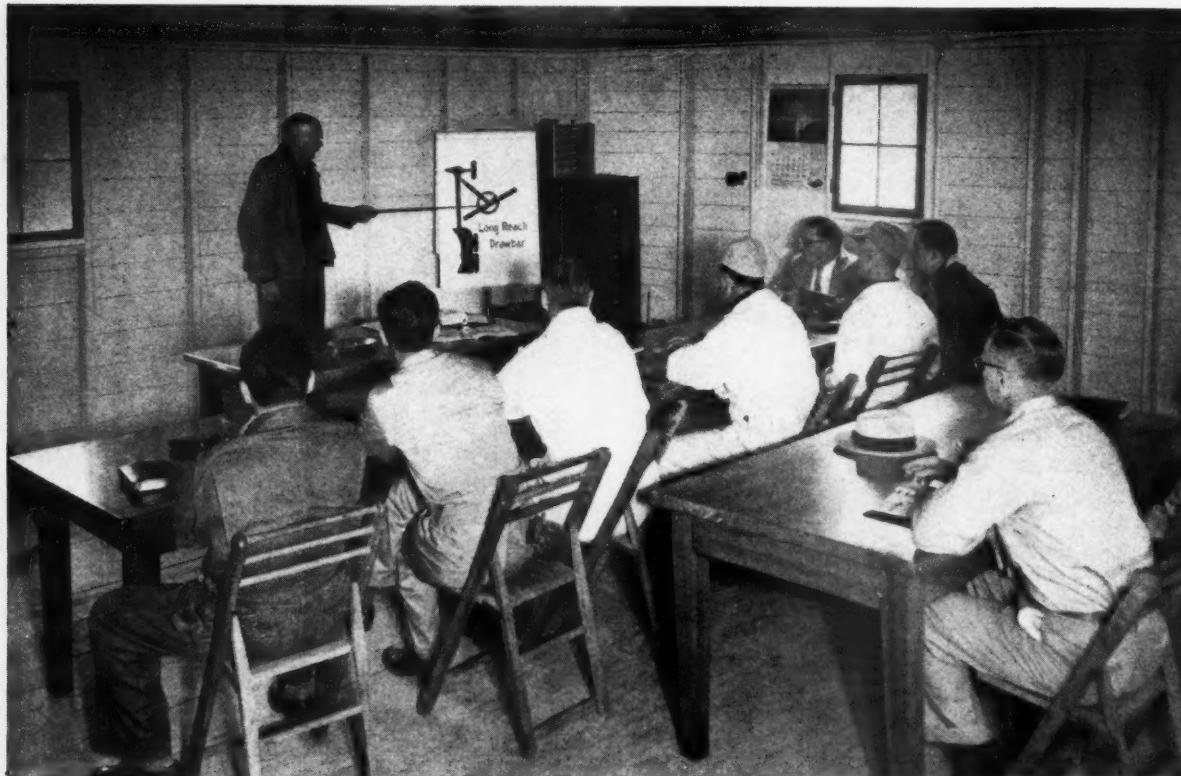
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS

UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE 
Excellay Preformed

UNITED STATES STEEL

Preventive Maintenance Cuts Service Cost — Increases Earning Capacity



PREVENTIVE MAINTENANCE TRAINING KITS — movies, slides, charts and literature are available to help train your personnel. Your Allis-Chalmers dealer will pre-

sent it for you at your convenience, or arrange to have a factory man do the job. And it can be tailored to suit your specific machines and job conditions.

How mine operators can take full advantage of Allis-Chalmers Dealer Service Plan to help protect profits

BENEFITS:

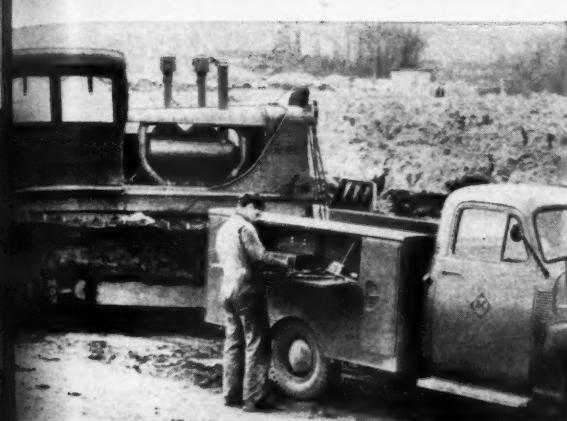
Better performance — more time on the job — longer equipment life — lower maintenance cost — higher resale value

Experience has convinced many mine operators that the Allis-Chalmers Dealer Service Plan is geared to keep equipment operating efficiently. They have found that taking full advantage of such service is easy, and that it pays big dividends. Here's why.

Allis-Chalmers dealers offer them a *planned* approach to service, right from the day their equipment is delivered. It covers everything from service schools to lubrication schedules, and from parts to preventive maintenance.

You owe it to yourself to take a look at the advantages this plan offers. Then see your nearby Allis-Chalmers dealer soon and ask him to give you all the facts.

ALLIS-CHALMERS
TRACTOR DIVISION - MILWAUKEE 1, U. S. A.



FAST PARTS SERVICE — Factory-built Allis-Chalmers parts are stocked in quantities by the *dealer*, to give you parts service as close to your job as possible. And remember, experienced equipment men agree it pays to use only standard factory-built parts.



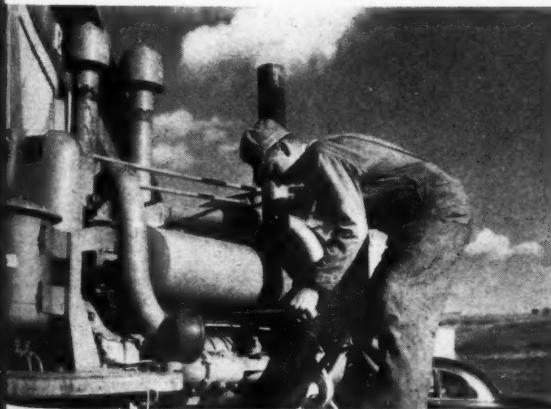
SCHEDULED CHECKUP PROGRAM — Your Allis-Chalmers dealer will help you plan a schedule for all maintenance to keep your equipment operating efficiently. You'll save on repair bills, avoid costly downtime, get far better performance, longer life from your machines.



OPERATING TIPS — Allis-Chalmers dealer servicemen are trained to give your operators all the facts they need to operate your equipment most productively. For example, one of the most important things for an operator to know — how to recognize when adjustments should be made.



SPECIALIZED FACILITIES at your Allis-Chalmers dealer include factory-approved tools and all necessary service equipment. Factory-approved methods are used to save you time and money, assure finest workmanship, to help you get full value for your equipment dollar.



FACTORY-TRAINED DEALER SERVICEMEN have the specialized experience to help you spot trouble symptoms fast, help you prevent costly breakdowns. Their training never stops; they make it a *policy* to stay abreast of every development so they can be of real value to you. And they're ready to go when and where they're needed.



FACTORY SERVICE SCHOOL TRAINING is open to your servicemen just as it is for dealers. Training is by men who know the equipment best. Visual aids and easily understood literature are used. And your men discover that Allis-Chalmers design simplicity makes the equipment easy to learn... easiest of all to service.

Auger mines 700 tons of coal per shift with TIMKEN® bearings taking the thrust loads

THIS Compton Auger, manufactured by Compton, Inc., Clarksburg, West Virginia, actually pulls coal out from underneath overburden and loads it on a truck at the rate of three tons a minute. Even with necessary auger shaft changes it mines 700 tons of coal per normal shift with a maximum four-man crew.

A 300-hp engine forces the auger into the seam. The tremendous resulting thrust load is carried by Timken® tapered roller bearings on the auger shaft. On top of this, the Timken bearings support the heavy weight of the

shaft itself. Being tapered, Timken bearings take both radial and thrust loads.

Shock loads aren't a problem either. Timken bearings are case-hardened to give them hard, wear-resistant surfaces over tough, shock-resistant cores. And full line contact between their rollers and races gives Timken bearings load-carrying capacity to spare.

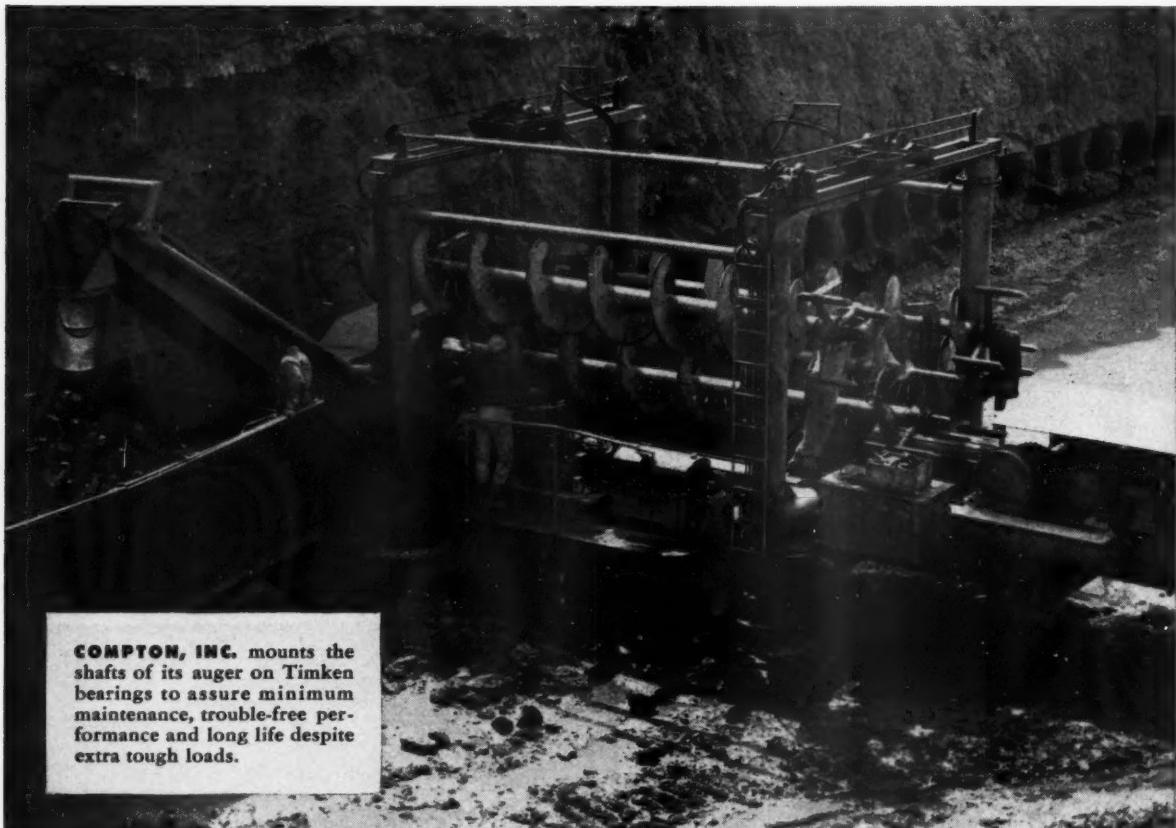
Wear is held to a minimum because Timken bearings practically eliminate friction. They're designed to roll true and are precision manufactured to live up to their design. We even

make our own steel to control quality all the way. No other U. S. bearing manufacturer does.

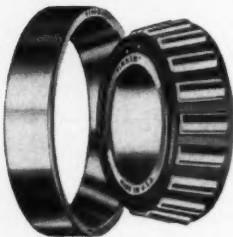
To get these advantages in the equipment you build or buy, always specify bearings with the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



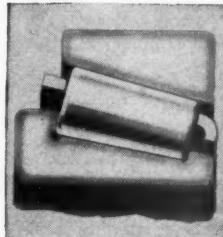
This symbol on a product means its bearings are the best.



COMPTON, INC. mounts the shafts of its auger on Timken bearings to assure minimum maintenance, trouble-free performance and long life despite extra tough loads.



TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis Timken steels.

NOT JUST A BALL ○ NOT JUST A ROLLER ○ THE TIMKEN TAPERED ROLLER ○ BEARING TAKES RADIAL ○ AND THRUST → ○ LOADS OR ANY COMBINATION ○



Mining

CONGRESS JOURNAL

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Published Monthly. Yearly subscriptions, United States, Canada, Central and South America, \$3.00. Foreign \$5.00. Single copies, \$0.30. February Annual Review Issue, \$1.25. Entered as Second-class Matter, January 30, 1915, at the Post Office at Washington, D. C.



VOLUME 41 • NO. 2
FEBRUARY • 1955

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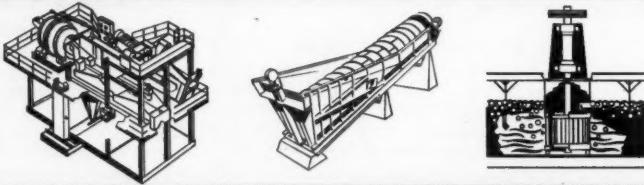
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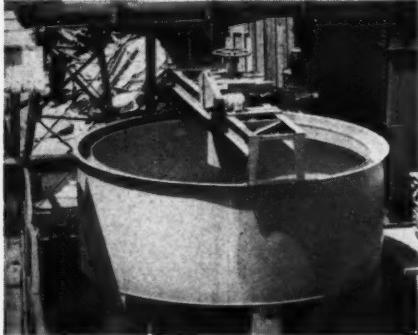


MOBIL-MILLS

S-H CLASSIFIERS

FAGERGREN FLOTATION MACHINES

Behind these familiar products is the WEMCO name and reputation — the reason you rely on WEMCO equipment to do your job best.



WEMCO THICKENERS:

Sizes and Types: WEMCO Thickeners are job-tailored to specific applications and are available in sizes up to 400' diameter. Job requirements determine use of Beam (up to 45'), Lo-Truss (32' to 60'), Hi-Truss (60' to 100'), Center Pier (75' to 175') or Traction (125' to 400') type of construction.

Features: Depending on application, WEMCO Thickeners offer a wide choice of construction and mechanical features. These include: heavy duty worm or spur gear mechanisms and bearings; large feed wells; strong cast spiders; overload alarms; manual or motorized screw lifting devices on small sizes; vertical hydraulic lift on Center Pier type; chain and sprocket gear-motor drive on small sizes; dual fluid drive on Center Pier and Traction types; large diameter discharge cones; wood or steel tanks.

— but here's something you may not know

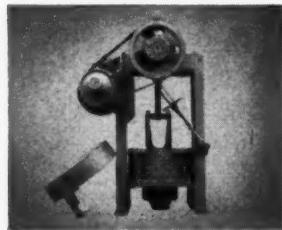
— WEMCO also makes a complete line of Thickeners, Hydroseparators and Diaphragm Pumps. Because they give you true WEMCO value — in performance, economy and reliability — you'll want to know more about them. Look over these specifications...it pays to know WEMCO.



WEMCO HYDROSEPARATORS:

Sizes and Types: WEMCO Hydroseparators are available in sizes up to 100' diameter. Duty requirements determine use of Beam (up to 40'), Lo-Truss (35' to 55'), or Hi-Truss (55' to 100') type of construction.

Features: Depending on job requirements, WEMCO Hydroseparators offer a wide range of construction and mechanical features, including: heavy duty worm gear mechanisms and bearings, large diameter cold rolled steel shafts, large feed wells and discharge cones, strong cast spiders, manual or motorized lifting devices and efficient drive arrangements.



WEMCO DIAPHRAGM PUMPS:

Sizes and Types: WEMCO Diaphragm Pumps are available in 2", 3" and 4" sizes. Each size can be obtained in either simplex, duplex or triplex arrangements.

Features: WEMCO Diaphragm Pumps are designed and built for efficient, trouble-free operation. Features include: Rugged welded steel frame, uniformly weighted rubber ball valves, rubber valve seats, long wearing rubber diaphragm, adjustable stroke and indicator, handwheel-operated variable speed drive for speed adjustment while pump is in operation.

FOR FURTHER INFORMATION — Call or write to your nearest WEMCO sales engineer. He will be glad to give you full details.

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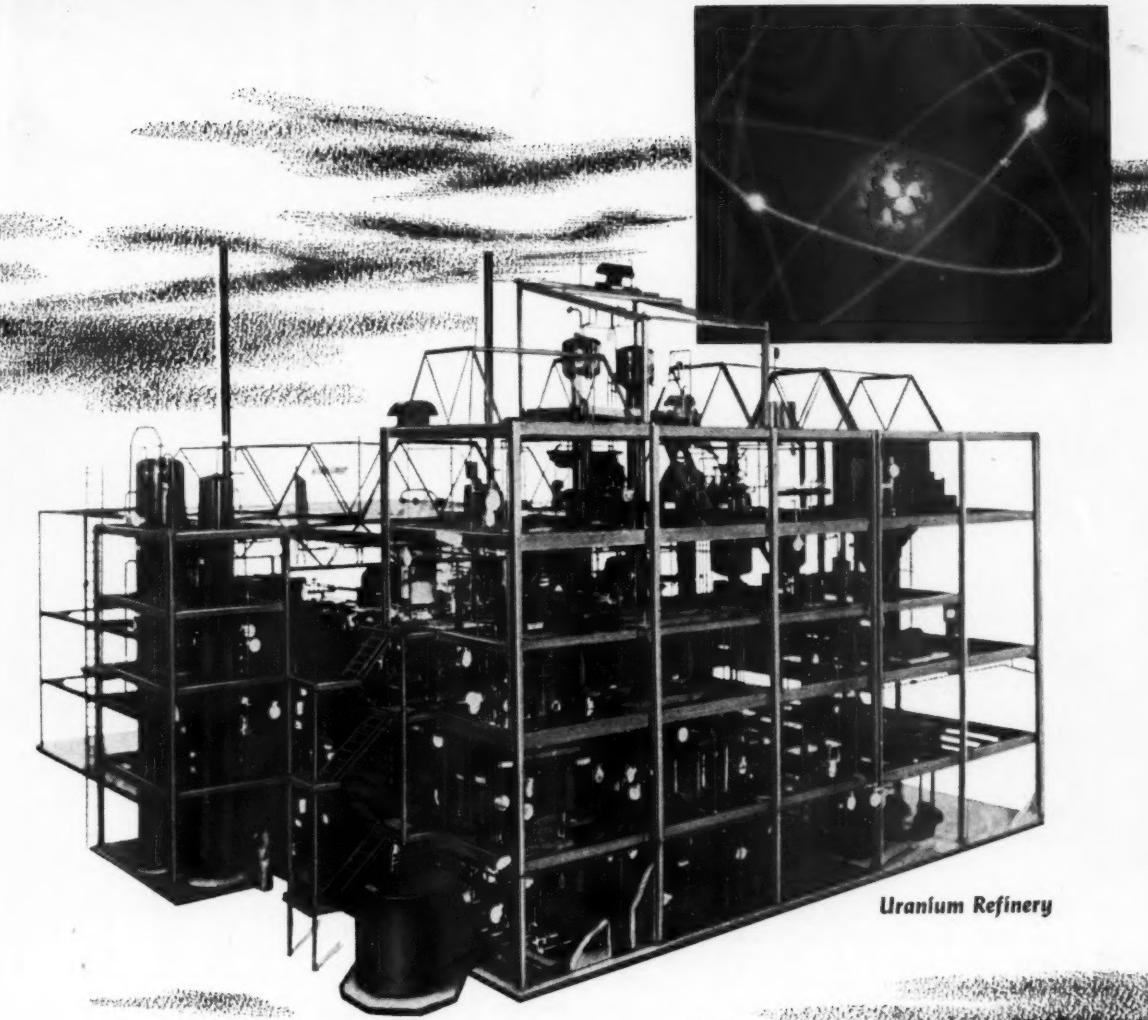
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Uranium Refinery

MODEL for Tomorrow

The full scale commercial uranium refining plant—of which this is a model—is now under construction at Port Hope, Ontario, and will be completed in 1955, the first of its kind in Canada. With engineering and construction by Catalytic, it will make available to Eldorado Mining and Refining, Limited (a Crown Company)

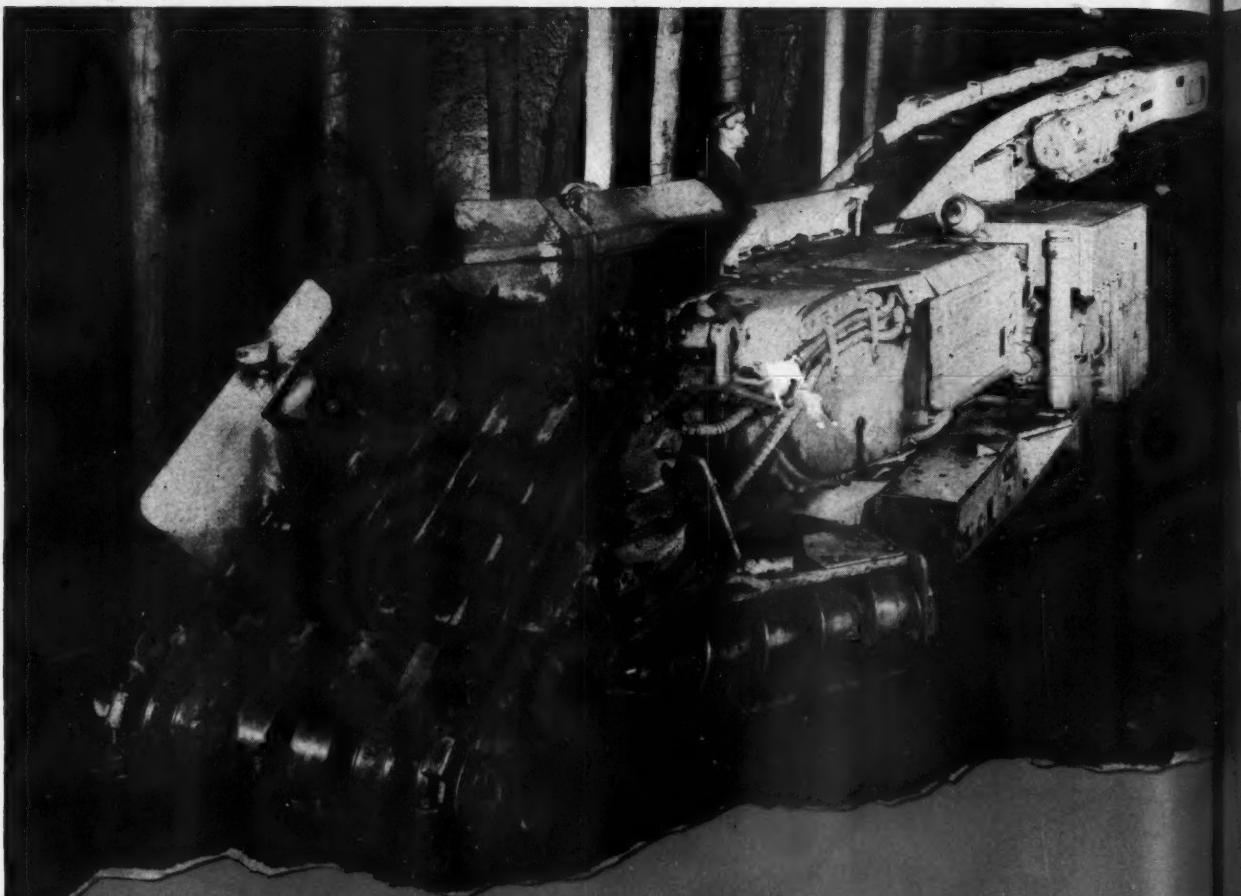
the most advanced processes for uranium refining. This new example of our services in advancing uranium technology portrays Catalytic's position of leadership in the industry of tomorrow. We welcome your inquiries today—that Catalytic's on-time, on-budget services may contribute to your success of tomorrow.

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CATALYTIC CONSTRUCTION
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This is the JOY 1-CM Continuous Miner



Here's what the 1-CM did during a recent month's run

TOTAL PRODUCTION FOR THE MONTH (RAW COAL)	17,818 TONS
TOTAL SHIFTS WORKED (TWO ON-ONE OFF).....	39
AVERAGE PRODUCTION PER SHIFT.....	457 TONS
BEST PRODUCTION SHIFT.....	650 TONS
WORKING CREW CHARGED TO THE UNIT.....	8½ MEN PER SHIFT
AVERAGE PRODUCTION PER MAN PER SHIFT.....	53.8 TONS



The results above cover a regular month of operation in a West Virginia mine. The Joy 1-CM unit was teamed with two Joy 10-SC shuttle cars unloading on belt conveyors. The coal is in the Pittsburgh seam and averages about 8 feet in thickness. Mining height is limited to about 7 feet, some head coal being left for roof support, and some bottom coal because of high ash and sulphur content.

DIFFICULT CONDITIONS . . .

The seam contains numerous clay veins varying from a few inches to 4 feet thick, resulting in both bad top and bottom when encountered. Frequency of these clay veins is indicated by the fact that 76 shuttle car loads of clay vein material were hauled during the period covered by this performance report. The seam also contains some pyrite in the form of lenses and laminations. The top was controlled by wood timbering as the Miner advanced, followed later by roof bolting on the off-shift.



Write for Bulletins, or

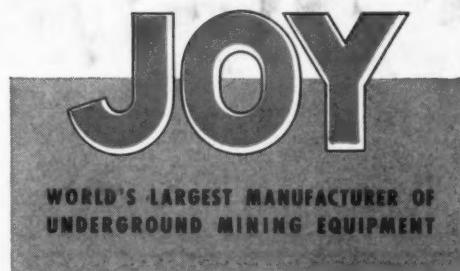
Consult a Joy Engineer

W & D CLS492

EXCELLENT RESULTS!

You'll note that the Joy 1-CM showed an average production for the month of 457 tons of raw coal per shift, or 53.8 tons per man-shift. That actually represents an increase of about 40% over conventional mining methods. It is also an interesting fact that the size consist varied very little from conventional methods. *Those are results that speak for themselves!*

For heavy-duty operation and high-tonnage production in seams of 52" and higher, the Joy 1-CM-2 model (illustrated at left) will pay you handsome dividends in reduced cost per ton. For lower coal, there's the popular 3-JCM Continuous Miner, only 34" in over-all height. • Let us help you to protect and increase your profit margin under today's conditions. **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario**





Experience

which you can profitably use

Roberts & Schaefer Company has available for your use the accumulated experience of more than fifty years of close cooperation with the Coal Mining Industry in the design and construction of equipment for handling bulk materials.

This service has not been confined to modern, cost-saving coal preparation plants, although this has undoubtedly been our greatest single activity. It has also included all the additional services and facilities required in handling bulk materials, and has covered a wide range of activities including conveying and handling, loading, storage and even such necessary facilities as sewage treatment and disposal.

Why not make greater use of this experience?

The Roberts & Schaefer organization is composed of specialized engineers who work as a group to apply their different skills to a single end. The construction force has a nucleus of trained and experienced men who have worked together on many different projects. On a majority of jobs, fabrication is handled in R & S own shops to meet delivery schedules and reduce costs.

Here, in a single organization, you have the experience, the knowledge and the facilities you can employ with complete assurance . . . and a long list of satisfied customers. We welcome your inquiries; and consultation, of course, does not obligate you in any manner.

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Subsidiary of Thompson-Starrett Company, Inc.

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ANNOUNCING THE NEW BUCYRUS-ERIE

A
Rotary Drill
for
 $6\frac{3}{4}$ to 9-inch
Holes

40-R

Here's big news for quarry and mine operators—
Bucyrus-Erie has added another model to its line of rotary
blast hole drills. It's the 40-R—designed for drilling $6\frac{3}{4}$
to 9-inch holes.

Like the bigger 50-R, this new drill features the flexibility
of Ward Leonard variable-voltage control—an outstanding
electrical control that gives the operator smooth instant
command over rotation speed of drill pipe at all times. In addition,
you have your choice of either electric or diesel-electric power
plus these other outstanding field-proved advantages.

- ① Hydraulically powered down pressure on the bit
for maximum controlled penetration.
- ② You can drill continuously for $27\frac{3}{4}$ feet before an
additional drill pipe section is added.
- ③ Motor-controlled drill pipe rack holds four sections
of pipe, any one of which can be moved into position
over the hole and screwed tight mechanically without
operator leaving control station.
- ④ Compressed air is used as a bit coolant and as a
cutting remover. Fine cuttings are picked up and han-
dled by a Roto-Clone precipitator; heavies pile up
adjacent to the drill hole for use as stemming material.

Complete information is yours for the asking. Just fill
in the coupon and mail it today.

**BUCYRUS
ERIE**

SOUTH MILWAUKEE, WISCONSIN

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

Gentlemen: I'd like more information on your new 40-R.

Send a bulletin Or better yet, have your salesman
call and tell me.

NAME _____

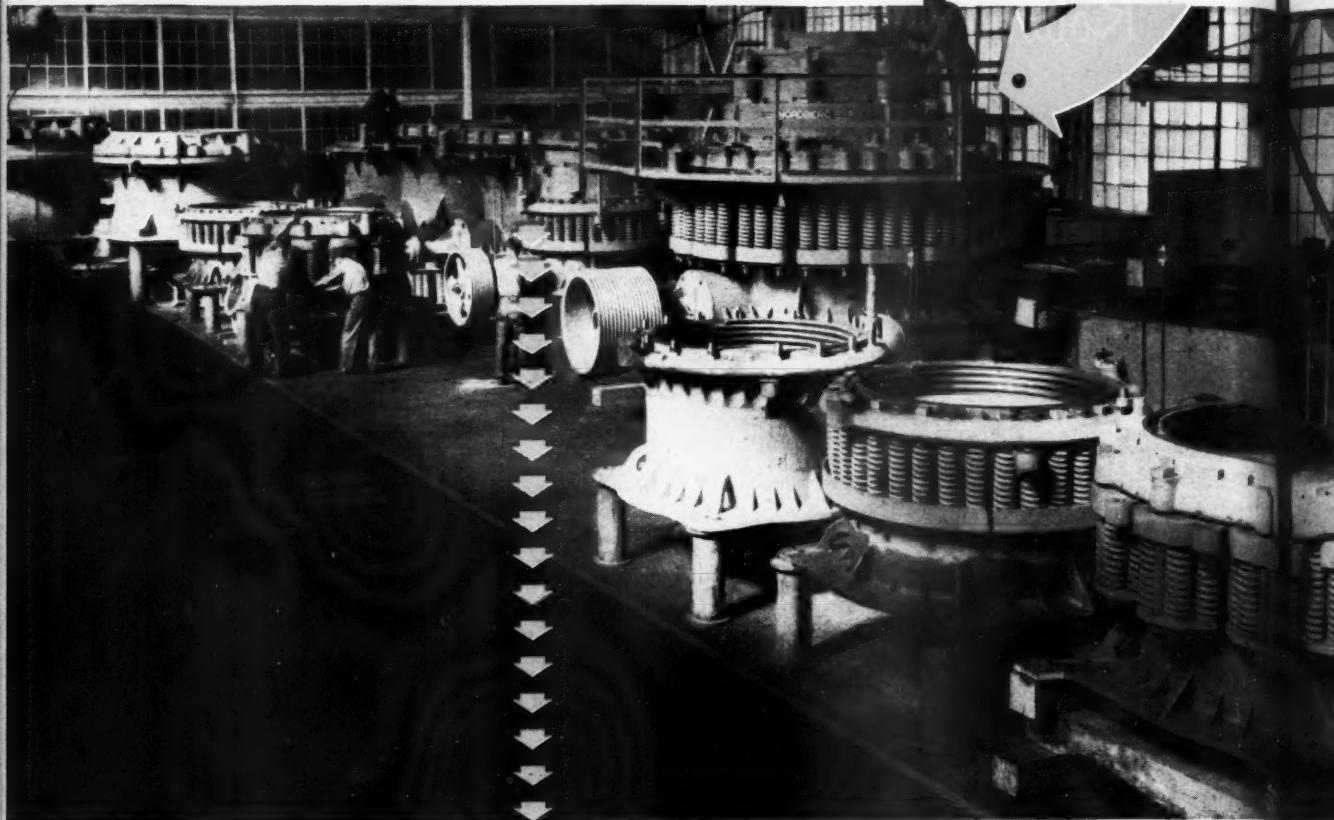
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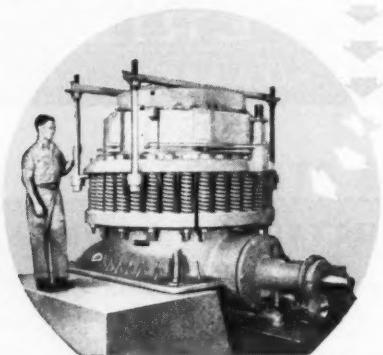
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Here's the 5000th SYMONS®



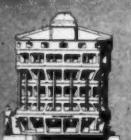
...and here is SYMONS
CONE CRUSHER No. 5001...
built for one of the
world's outstanding Slag Producers



With the 5,000th SYMONS CONE CRUSHER completed, production on Number 5001 was well along . . . a 4' standard crusher scheduled for delivery to one of the world's largest slag producers—who have installed a total of 63 SYMONS CONE CRUSHERS for the dependable, profitable crushing of huge tonnages of slag.

This installation points up the important fact that a large proportion of all SYMONS CONES in service are repeat orders from satisfied users. For example, here are just a few fields in which SYMONS CONES are used, and the number of repeat orders placed by single users in each field:

ASBESTOS.....	18	IRON.....	32
ABRASIVES.....	16	LEAD-ZINC.....	24
CEMENT.....	6	MOLYBDENUM.....	18
COPPER.....	41	NICKEL.....	28
FELDSPAR.....	15	NITRATE.....	11
GOLD.....	8	REFRACTORIES.....	12
GRAVEL.....	18	STONE.....	39



SYMONS
TRAYATORY CRUSHERS



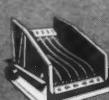
NORDBERG
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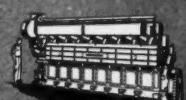
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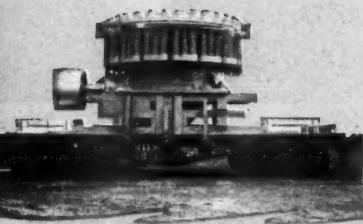
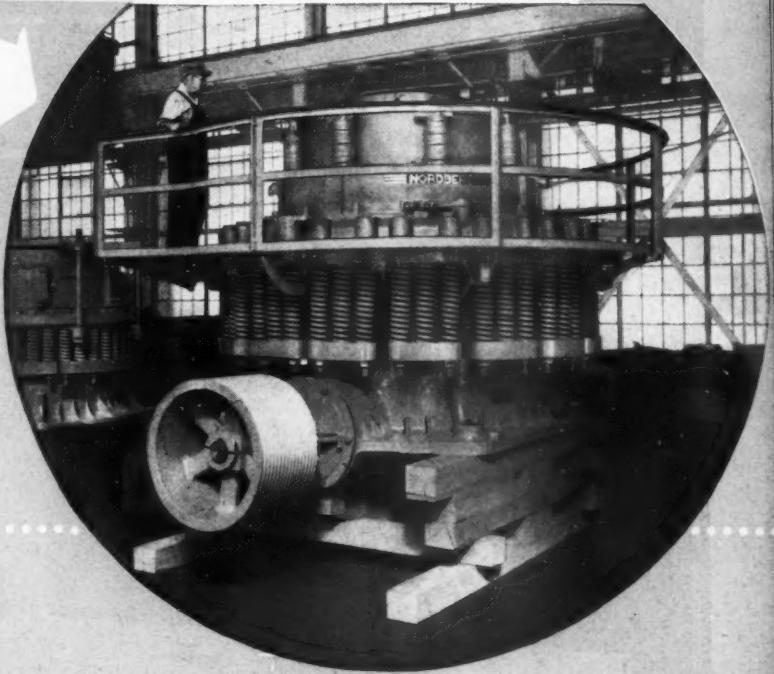
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GRIZZLES AND SCREENS



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SPARK-IGNITION GAS ENGINE

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A RECORD MADE POSSIBLE
THROUGH REPEAT ORDERS
OF THE WORLD'S LEADING
PRODUCERS OF ORES AND
INDUSTRIAL MINERALS



No. 5000 . . . one of 37 Super Heavy 7-ft. SYMONS
CONES destined for the Lake Superior Iron Ore Region to process TACONITE

● The introduction of the SYMONS CONE CRUSHER, little more than a quarter of a century ago, marked a new era in fine reduction crushing operations. No other type of crushing machinery ever received such enthusiastic acceptance . . . and today its world-wide use is unparalleled.

A typical example of this universal acceptance is the fact that this 5,000th SYMONS CONE CRUSHER will soon be installed in the Lake Superior Region—one of 37 Super Heavy 7-ft. SYMONS

CONES that have been given the difficult assignment of crushing the hard, tough Taconite Iron Ores.

For in Taconite . . . as in all of the great ore and industrial mineral operations the world over . . . there has been no record to equal the performance of SYMONS CONE CRUSHERS that have so consistently and efficiently produced great quantities of finely crushed product at low cost. These, then, are the machines that have truly revolutionized modern crushing practice!

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C654

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS
NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
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NORDBERG MFG. CO.
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SYMONS . . . A REGISTERED NORDBERG TRADEMARK
KNOWN THROUGHOUT THE WORLD



COORDINATED
PLANNING
RESULTS IN

Something Extra

WITH EVERY

FAIRMONT
PREPARATION PLANT

For more than half a century Fairmont Machinery Company has been producing coal handling and preparation plants with "Something Extra"! "Something Extra" which is the direct result of painstaking coordinated planning plus responsibility. Here, then, are the reasons why a coal

preparation plant by Fairmont is a model of top operating economy and notably increased separating efficiency—both of which lead to the upgrading of your product . . . a vital factor in pleasing today's discriminating coal buyers.

TURN TO FAIRMONT for the "Extras" which will put you out ahead:

1. Coordinated, qualified engineering, fabricating and erecting.
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4. A competently-planned installation for your present needs with provisions to cope successfully with future demands.

If you have a knotty preparation problem—if you want a plant which will turn out a guaranteed uniform product

and give you over 99% separating efficiency through a product size range of $\frac{1}{8}$ " to 10" in any tonnage capacity—

Call A FAIRMONT engineer.

FAIRMONT MACHINERY COMPANY

FAIRMONT, WEST VIRGINIA

DESIGNERS AND CONSTRUCTORS OF COMPLETE COAL PREPARATION PLANTS USING BOTH WET AND DRY CLEANING, CENTRIFUGAL AND THERMAL DRYING.

**NOW AVAILABLE
BOWDIL CUTTER
CHAIN WITH BIT
OPENING $\frac{1}{2}'' \times 1''$**



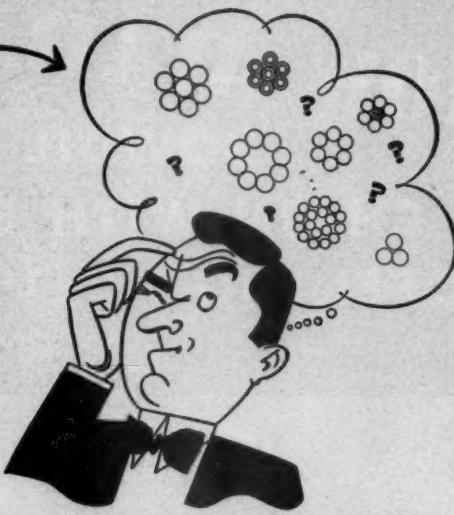
... every construction
feature that has made Bowdil
Chain the standard of the industry

This model Bowdil Chain has been made available in response to many requests from operators desiring the performance features of Bowdil Chains but whose existing equipment represents a sizeable investment (such as in sharpening equipment), where a changeover to complete Bowdil Bits is felt uneconomical at present, or where changing and varying conditions do not make such changeover practical. This $\frac{1}{2}'' \times 1''$ Bit Chain operates in all Bowdil Cutter Bars as well as all makes of other bars. Takes all types of $\frac{1}{2}'' \times 1''$ bits.

SALES ENGINEERS IN — Whitesburg, Kentucky — West Frankfort, Illinois
Charleroi, Pennsylvania — Denver, Colorado — Big Stone Gap, Virginia
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Company
CANTON 7, OHIO

**WHY
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wire rope
selection?**



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You get better service when you order the right rope from
the thousand and one wire ropes

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A Macwhyte representative will gladly supply you with specifications for the correct rope to use on each machine you have. Call your Macwhyte distributor, or write direct to Macwhyte Company for recommendations. Catalog on request.

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Manufacturers of Monarch Whyte Strand PREformed, Internally Lubricated
Wire Rope, ATLAS Braided Wire Rope Slings, Aircraft Cables and Assemblies,
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Photograph by Howard Luray

For Moving Mountains...or Digging Coal...

Standardize on AMERICAN Explosives and Accessories

Wherever the stroke of the detonator sets the earth shaking, American blasting materials help speed the work.

Experienced shooters everywhere rely on American explosives because they know they're dependable—that they're produced by modern methods and under strict laboratory control to give the results that shooters want. Available in a wide range of densities, velocities and strengths, American explosives are designed to do your job best—because constant field research tells us what you need. Capable field engineers are available at your call.

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drilling for 400,000



KW of electricity...

Some 200 miles north of Sao Paulo, Brazil, Ebasco Services is engineering and constructing the Peixoto Hydro Electric Development, for Cia. Paulista de Forca e Luz. When completed, the harnessed waters of the Rio Grande will furnish 400,000 KW of electricity for the industrial development of the area.

To build the dam and accessways to it, meant moving many hundred tons of earth and rock — and for that big job Crucible Hollow Drill Rods were chosen. Experienced construction men *know* they can depend upon these rods for *optimum* performance *at lowest cost per foot of hole drilled*.

That's because Crucible Hollow Drill Rods are built to *tool steel* standards, by the leading producer of tool and special purpose steels. That means fewer broken rods or valuable bits lost on the job. So be sure that on your drilling jobs you specify Crucible Hollow Drill Rods. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

CRUCIBLE

first name in special purpose steels

Crucible Steel Company of America



FOR

MAIN DRIVE MOTORS AND GENERATORS • ROTARY CONVERTERS • HEAVY-DUTY GENERAL-PURPOSE MOTORS

IMPROVES MACHINE PERFORMANCE...

One of the most outstanding brush developments in twenty years, the new "National" N-4 brush is especially recommended where heavy load-swing requirements require exceptional brush characteristics to assure smooth, trouble-free operation. The ability of this new, "National" brush grade to deliver peak-commutation under the most difficult service conditions is one of its outstanding characteristics.

CUTS OPERATING COSTS...

Users of the new N-4 brush report up to twice the brush life ever obtained with any previous grade. Such results occur wherever N-4 brushes are applied to main drive motors and generators, rotary converters and heavy-duty motors. And here's more good news — N-4 brushes cost no more than comparable grades now being used in these services!

The term "National", the Three Pyramids device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation
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Sales Offices: Atlanta, Chicago,
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YOURS FOR THE ASKING...

Dept. MC 2-5

National Carbon's instructive pamphlet series on the practical aspects of motor and generator maintenance. Supervisors should request as many copies as they need to distribute personally to their men. Coupon automatically brings back-issues and each new, bi-monthly issue for two years or more.

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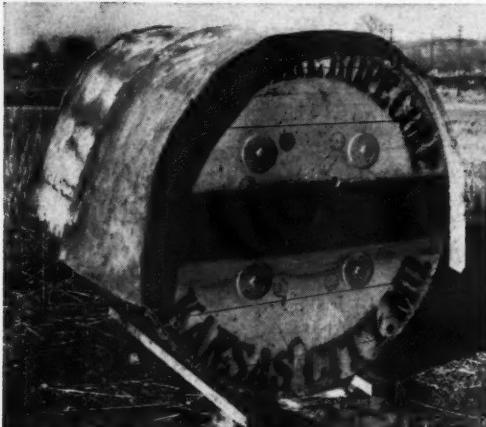
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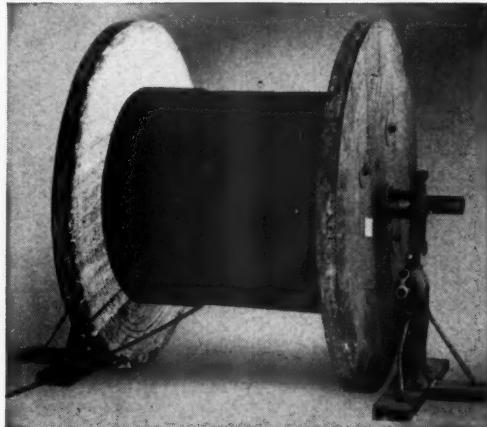


Tuffy® tips on getting



Store Rope Like This

Keep spare rope in a dry, sheltered place free of dust, vapors or fume-laden air. If stored out of doors, set reel on blocks off the ground. Clear away weeds and grass and protect with a waterproof covering as shown. Check each month for rust caused by moisture collecting on the rope. Paint with a heavy crankcase or cylinder oil if rust is discovered or even before it shows up if moisture is present.



Unwind Like This

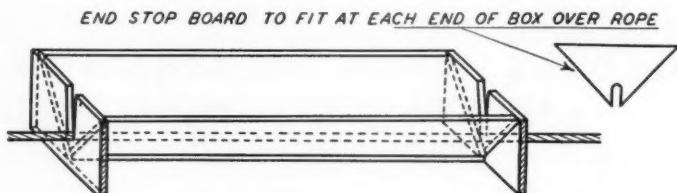
When getting ready to install the rope, special care should be taken to see that the reel is set up for smooth, easy unreeling. Set reel up on jacks as shown above and unreel so the rope pulls off from the bottom of the reel—not from the top. Coils should be put on a swift or rolled on the ground to pay off the rope. Kinks or "doglegs" may result from incorrect unreeling, seriously damaging wires of the rope and greatly reducing the ultimate life.

Always Keep Rope Lubricated

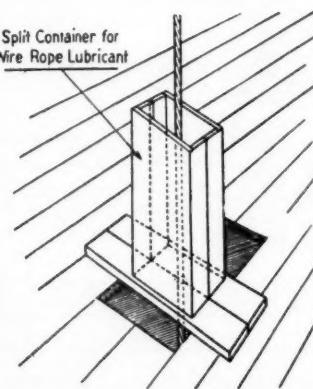
Rope That Is Stored for long periods of time should be lubricated during installation. If it is not possible to lubricate stored rope very often, apply a sealing compound to hold the lubricant that is already present.

Rope In Use can be lubricated most economically without removing it from the equipment on which it is operated. Lubricate rope as often as it needs it—service conditions determine the frequency.

Use Lubricant Hot or Cold, depending on its penetrating qualities. Your local oil company engineer will be able to recommend an oil that will actually penetrate to the working parts of the rope, and not just form a coating that peels off the first time your rope runs through a sheave.

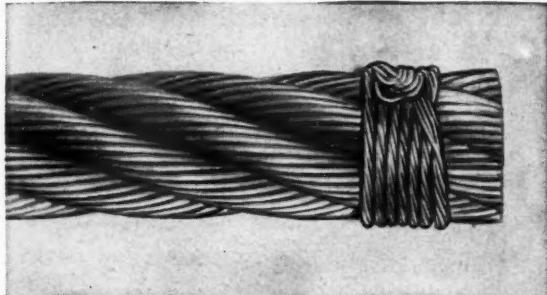


Two Home-Made Oiling Devices



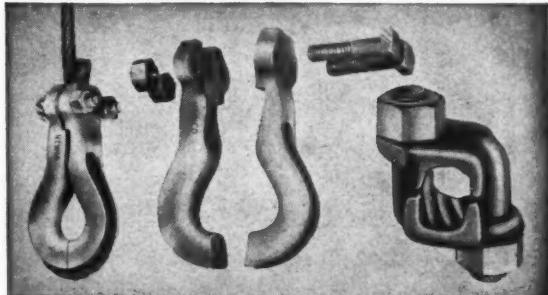
These two oiling devices can be used without removing the wire rope from the equipment on which it operates. One is for vertical ropes, the other for horizontal ropes.

extra service from *WireRope*



Seize Tightly For Cutting

Cutting can throw the strands out of fabricated position and, in time, result in kinks or doglegs. Seizing the rope securely before cutting, as shown above, assures that no movement of the strands can occur when you make cuts. Because most ropes are now preformed, and stress free, only one seizing wire at each side of the cut is needed.



Attaching By Clipping

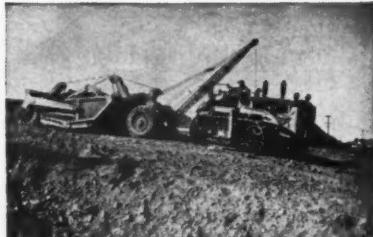
The fittings you use on wire rope can handicap it or enable it to work at full efficiency. Fittings which derive holding power by crimping action are harmful to the rope. Shown here are two rope clamps. One is a combination clamp and thimble. Both provide snug saddling of the rope and grip larger and uncrimped bearing surfaces so tightly that the loads are carried almost solely by the force of friction.

Available To You: The *WireRope* Experience of Specialists

Working with users to whip wire rope problems has provided Union Wire Rope engineers a wealth of on-the-job experience. Out of this priceless experience has come a family of wire ropes for special purposes.

Into them is put the grade of steel, the rope construction and operating characteristics which laboratory research and field development have proved best for the particular purpose for which made.

Forget Complicated Specifications - Say **Tuffy**



Tuffy Dozer Rope



Mount a 150' reel of 1/2" or 9/16" on your dozer, cut off only worn sections, save good rope otherwise wasted.

Tuffy Draglines

Extra toughness for prolonged service. Flexible enough to hug the drum when casting. Extra resistance to abrasion. Cuts replacement costs.

Tuffy Scraper Rope

A special rope construction balanced to meet the tough, complex stresses which scraper service deals out.

Tuffy Slings



Proof tested for strength. Easy to hitch on and off. Kinking will not materially damage the 9-part, machine braided construction. Team up with Tuffy Hoist Line.

Tuffy Slusher Rope



Maximum rigidity to fight off drum crushing, yet flexible on small toll sheaves. A unique, high strength 3-strand construction with high abrasion resistance.

Your Tuffy Distributor Works to Learn Your Business

When new equipment comes out, he has already checked into it...finding out why it does the job better, how it works. Why? Because he's interested in earning your continued patronage. And part of that service is helping you out with fast answers *when* you need them—especially right answers to your wire rope problems. Give him a call.

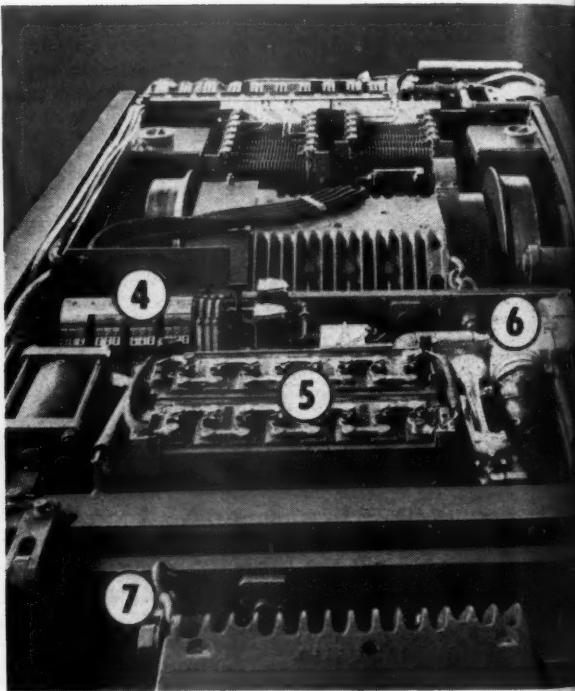
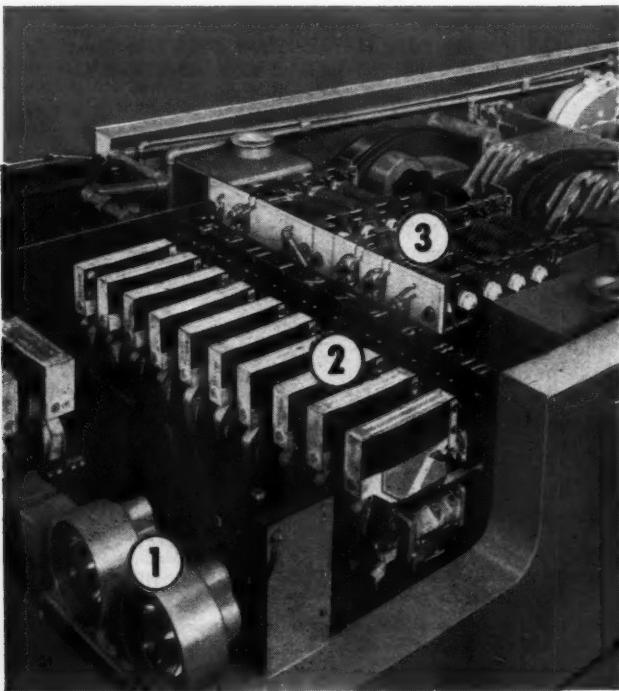
union  **WireRope CORP.**

1-M

2144 Manchester Avenue Kansas City 26, Missouri
Specialists in High Carbon Wire, Wire Rope and Braided Wire Fabric

for top performance . . . economy . . . safety

buy your next mine locomotive from the INSIDE



1. Sealed-beam headlights have 150-watt prefocused lamps. Good lighting assures convenience and safety.
2. Bank of 12 air-operated contactors saves space; air gives high tip pressure that increases capacity. Air contactors take small wattage, permit 32-volt battery control.
3. Continuous steel-strip resistance withstands hard knocks, eliminates many electrical troubles, affords maximum ventilation. Rod connectors to asbestos terminal board are all-nickel.
4. Space-saving air-operated reverser.
5. Battery for auxiliary power provides for dynamic braking and headlights if trolley pole jumps wire.
6. Blower to ventilate motors increases continuous capacity.
7. Safety chains prevent motor dropping to tracks should supporting hanger break.

Look at a few of the *inside* features next time you want a mine locomotive, and you'll buy Jeffrey!

Take the 30-Ton Separable Tandem Trolley Locomotive shown. This powerful main-liner is only 30" high, has a rated drawbar pull of 15,000 lbs. at 8.4 MPH. It is designed specifically for dependable daily service in low coal.

OUT

The "inside story" tells why this 30-Ton Jeffrey locomotive hauls big loads better, offers operating economy, is safer and more convenient for miners.

Behind a record of excellent performance is careful workmanship . . . rugged simplicity . . . orderly arrangement of components . . . easy accessibility to parts . . . fine construction features.

The close-ups on these pages reflect this locomotive's fine quality. Quality like this is characteristic of Jeffrey's complete line of trolley, cable reel and battery locomotives for main line or secondary duty.

Next time you have a mine haulage problem, call on Jeffrey. Write for Catalog 836 today and get the full facts, *inside and out*, on Jeffrey mine locomotives.

8. Two drawbars between units give locomotive a safety drawbar should one bar fail.

9. Bolt holes are counterbored, eliminating projections. Smooth frames protect workmen . . . no sheared bolt heads and nuts in case of derailment.

10. Air brakes are standard on big tandem locomotives. Dynamic braking with motors retards speed on grades.

The 30-ton locomotive at top left can be operated in tandem from either unit, or units can be separated and operated independently. Jeffrey also builds 16, 22, 40 and 54-ton tandem locomotives.



THE JEFFREY MANUFACTURING CO.

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PLANTS IN CANADA, ENGLAND, SOUTH AFRICA.

IF IT'S MINED, PROCESSED OR MOVED
... IT'S A JOB FOR JEFFREY!

Double YOUR FOOTAGE

in the softer rock formations



The new CP-555's short over-all length permits set-up in restricted quarters.

Now, for the first time, you can have a fast and powerful rotary drill with an entirely independent rotary motor feed that affords full control at all times. And it's all combined in one compact machine — the new CP-555 Rotauger. Available for dry or wet drilling, it drills 2½ inch holes in speeds of 2 to 4 feet per minute in depths to 100 feet or more in gypsum, talc, medium limestones and other softer formations. For more information write for Bulletin SP-3110.

Chicago Pneumatic Tool Company, 8 East 44th St., New York 17, N. Y.



Chicago Pneumatic

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COST-CUTTING MEMOS:



SPOT THE DRILL HOLES RIGHT: Drilling, drill patterns, and spacing are vital factors in reducing explosives costs. In hand-drill days, each hard-won hole was carefully planned to gain maximum breakage and to pull the entire length. Today, careful supervision should be employed to avoid boot-legs and poor fragmentation which result from hasty, unplanned drilling.



USE THE RIGHT SIZE CARTRIDGE: It's costly to tie up manpower arguing with stuck cartridges. Be sure you are getting the proper diameter for easy loading. In small diameter holes, take bit wear into consideration in ordering your explosives; reducing diameter of cartridge accordingly. Redi-Slit® cartridges can give both compaction and trouble-free loading.



USE ENOUGH STEMMING: Large diameter holes take a lot of explosives—too much for you to write off the waste of energy which results from "blown-out" shots due to insufficient stemming. Initiation with electric blasting caps at the point of maximum confinement also helps to put the explosives gases to full and profitable use in both large and small diameter holes.



COMPARE MILLISECOND DELAY RESULTS: Organized tests can show what may be achieved with millisecond delay shooting and which pattern gives best results. Check benefits not only in stoping, but also in drifts, raises, and sinking shafts. Open pit operations should compare progressive and alternate patterns. Sequence photos can show rock movement.

BETTER BLASTING is a combination of the right explosives plus the right methods. The economy and flexibility of fixed explosives in blasting operations have been firmly established. Here are a few of the many ways you can cut costs even further in both open pit and underground work . . . and aid the productivity of your loading crews. If your blasting methods haven't been checked lately, why not call your nearby Atlas representative? His suggestions may help you cut costs—and increase production, too. And write us if you'd like to receive the free, informative periodical "Better Blasting," published quarterly by Atlas to bring you technical tips and product announcements.



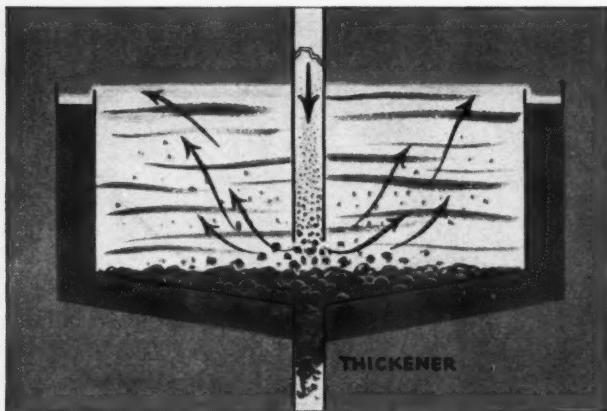
ATLAS EXPLOSIVES

"Everything for Blasting"

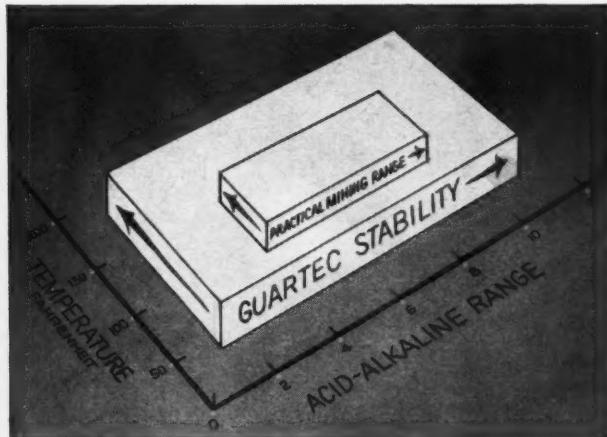
ATLAS POWDER COMPANY,
WILMINGTON 99, DELAWARE

Offices in Principal Cities

Now—Faster Settling in the Thickener with GUARTEC



Faster Settling in the thickener is one of the big advantages that Guartec can offer your refining operations. Guartec, with 5 to 8 times the settling action of starch, quickly agglomerates fine particles and settles them to the bottom, as shown above. There they form a loose mass that can be drawn off easily without blocking the outlet.



Wide Stability is a strong feature of Guartec for mineral operations. As the graph above shows, Guartec operates effectively in a pH range of 1.2 to 11 and flocculates at temperatures of 40 to 180° F. It is available in commercial quantities packed in 100 pound bags lined with moisture-protective pliofilm.

New Vegetable Gum Colloid Available in Commercial Lots

General Mills' new Guartec—a natural gum colloid of the guar seed settles ore and other solid particles faster and more uniformly than most flocculants. Many operators find that Guartec:

1. Improves mineral recovery
2. Cuts settling time
3. Speeds tonnage production rate
4. Permits greater production with same equipment
5. Cuts the frequency of plant "down" time
6. Features wide stability
7. Is effective under varied conditions

GUARTEC USES

Guartec is used in thickeners to "floc" slimes from uranium, zinc, iron ore, and manganese. It can clarify brines in potash refining, conserve water for re-use in iron ore processing, and perform many other flocculating jobs.

GUARTEC AMOUNTS

Mere "trace" amounts of Guartec will help you solve your settling problems. As little as 0.1 pound of Guartec (about 3¢) per 1,000 gallons of slime speeds settling in thickener or tailings pond. You get more tons of refined ore, faster, with the same equipment . . . and with no danger of losing fine ore values to thickener overflow.

Besides its settling action, Guartec also works well as a flocculant for filtering, and as a blinding agent to save on expensive collectors in froth flotation.

Try Guartec. See for yourself how it benefits your beneficiation. Send for your Guartec sample and literature, today.

For sample, prices and technical information, write to . . .

General Mills
Special Commodities Division

400 Second Avenue South
Minneapolis 1, Minnesota

Fiatt, Illinois Mine uses STANOIL

Industrial Oil in stripper hydraulic jacks for 18 years

At Truax-Traer Coal Company's Fiatt, Illinois, mine, the production goal is 1,000 tons of coal an hour. That's a stiff assignment. It leaves no margin for failure. This indeed applies to the hydraulic jacks of the company's Bucyrus-Erie 950-B stripper. It's the reason STANOIL Industrial Oil has been used as the hydraulic fluid in the four hydraulic jacks since the stripper went into operation in 1937. Eighteen years continuous service

is testimony to STANOIL's ability to deliver under any operating condition—heat, cold, rain, dust, dirt.

But there's more to the story than just the ability of STANOIL Industrial Oil to deliver under a wide range of operating conditions. The rest of the story is the Standard technical service provided by men with training and experience.

This combination—(1) top quality products (2) technical service provided by experienced men—is ready to serve you. Want this combination to go to work for you? In the midwest just call your nearby Standard Oil lubrication specialist. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



Since start of operations in 1937, STANOIL Industrial Oil has been used as hydraulic fluid in Bucyrus-Erie stripper at Truax-Traer Coal Company mine, Fiatt, Illinois. This 950-B stripper is hub of one of the biggest strip mining operations in Fulton County, state's second largest coal producing county.

Bob Wright, Standard Oil lubrication specialist is on the spot to provide technical service on lubrication problems. Bob has a B.S. in engineering from Michigan College of Mining. Before entering field sales work, Bob completed Standard's Sales Engineering School course in industrial lubrication. Customers find this experience and background pay off for them.



**STANDARD OIL COMPANY
(Indiana)**



Carry the load via Link-Belt belt conveyors... SEE YOUR COSTS GO DOWN

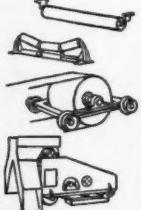
**LINK-BELT offers you the
"total engineering"
so necessary for
top efficiency**

DESIGNED FOR OVERALL EFFICIENCY



Because of its unrivaled experience, Link-Belt can do a better job of gathering and analyzing all data. Proposals reflect this understanding of the most practical way to fit conveyors into your overall system requirements.

BUILT FOR LONG- LIFE PERFORMANCE



Link-Belt manufactures all components and related feeders and conveyors. You are assured of the right equipment because of this breadth of line. And Link-Belt will supply the highest grade belts engineered to the job.

DELIVERS FULL RATED CAPACITY

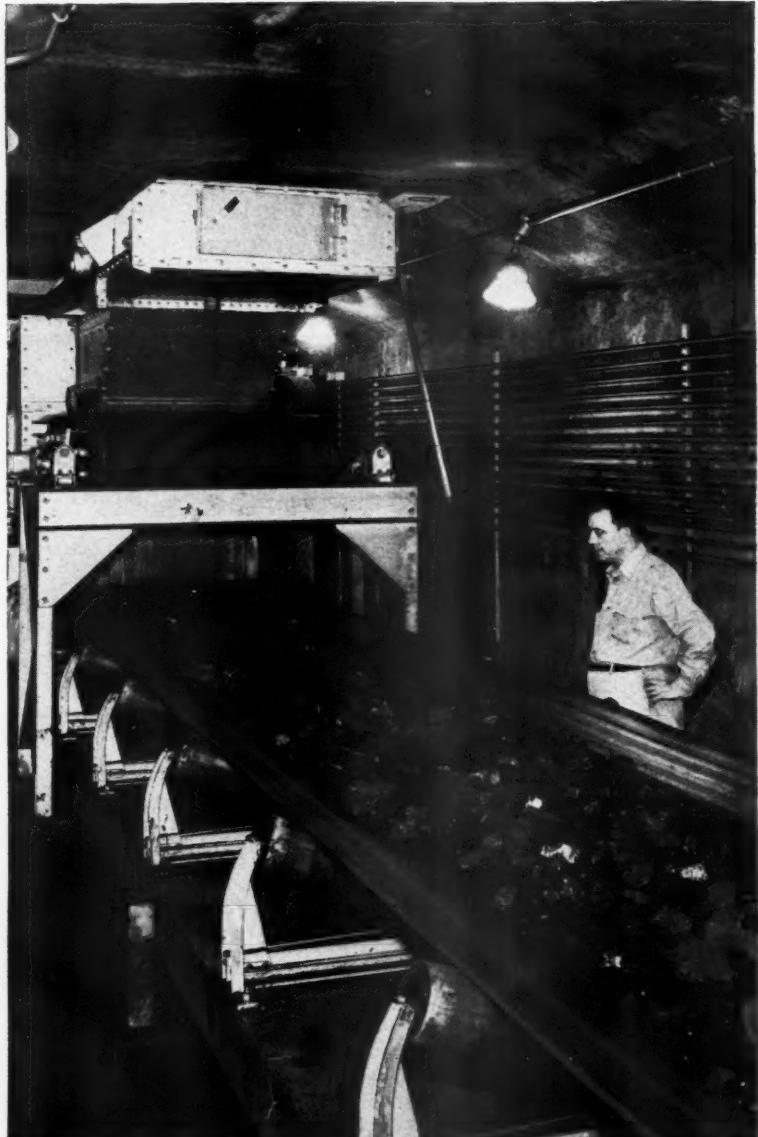


Link-Belt follows through on every detail of the job, including electrical controls and even wiring and foundations. What's more, Link-Belt will furnish experienced erection superintendents, staffs and skilled crews if desired.

ASSURE SATISFACTORY PERFORMANCE



When you rely on Link-Belt as a single source for your complete system, Link-Belt accepts responsibility for placing it in full operating readiness. We will also supervise modernization of existing systems.



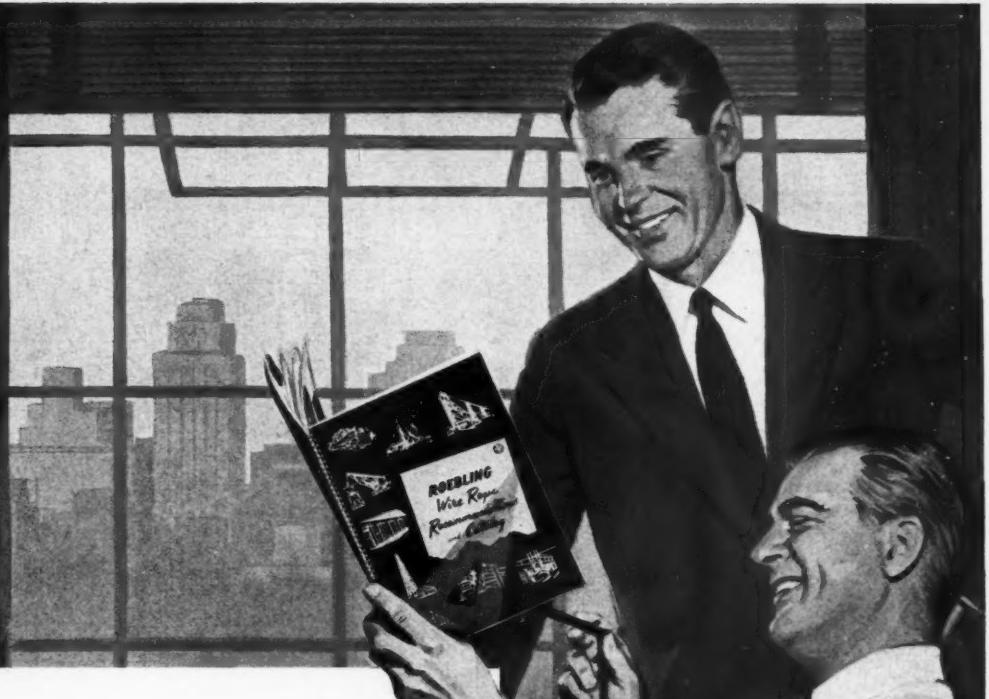
Link-Belt 60-in. wide belt conveyor served by eight L-B 48-in. wide belt feeders, in reclaim tunnel under coal dock.

WHETHER it's a single belt conveyor or a complete system, there's no substitute for Link-Belt equipment and Link-Belt engineering. Call the district sales office near you for all the facts on this unique single-contract service.

LINK-BELT
BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarborough (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs.

13-467



"The right wire rope? That's EASY every time!"

IT'S A CINCH to pick the right wire rope for top performance in mining . . . and it pays off! Roebling's new catalog has a section devoted to rope for the mining field . . . shows at a glance the best rope for each purpose and gives you a simple, unique code number ordering system which for the first time in wire rope history *positively* identifies the desired rope.

Write for your copy of the new "Roebling Wire Rope Recommendations and Catalog." And remember that the Roebling Field Man at your nearest Roebling office or distributor is always available to help find the answer to special wire problems.



ROEBLING



Subsidiary of The Colorado Fuel and Iron Corporation



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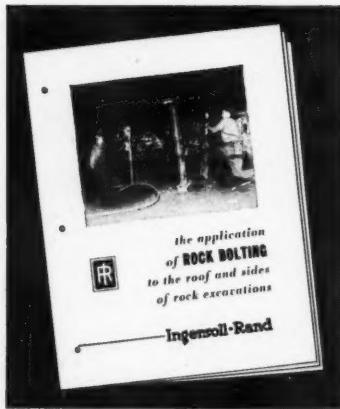


EVERYTHING for ROCK BOLTING

from the bit  to the compressor



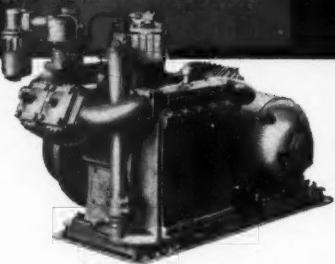
A complete line of coordinated equipment
that can help you pin down
your rock-pinning costs



FREE—NEW ROCK-BOLTING HANDBOOK

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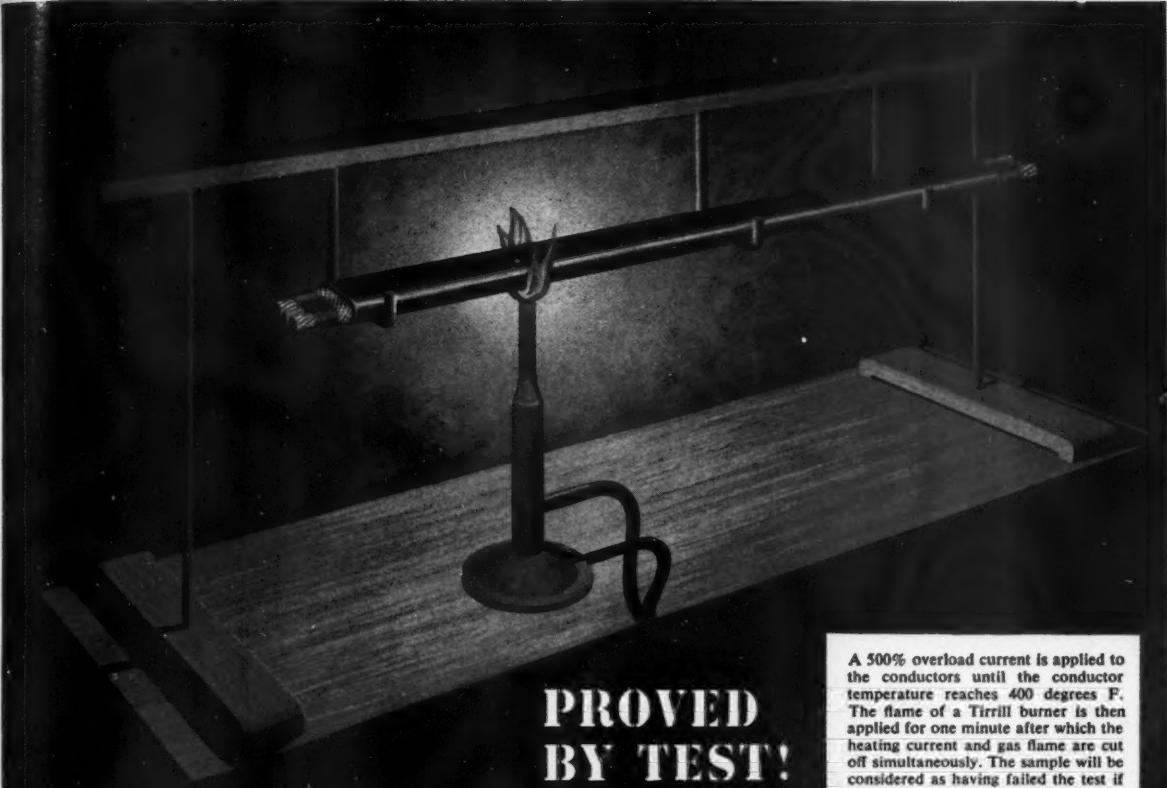
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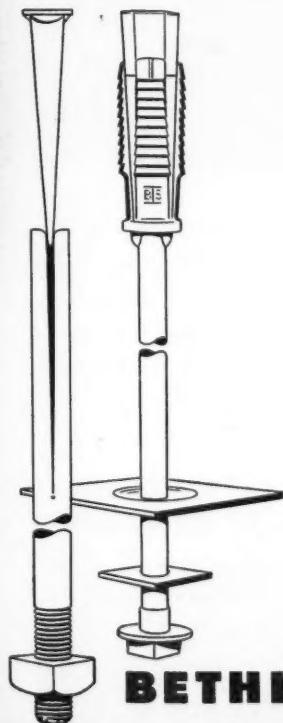
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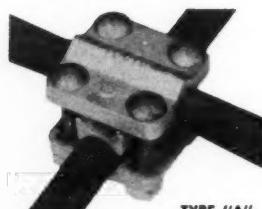
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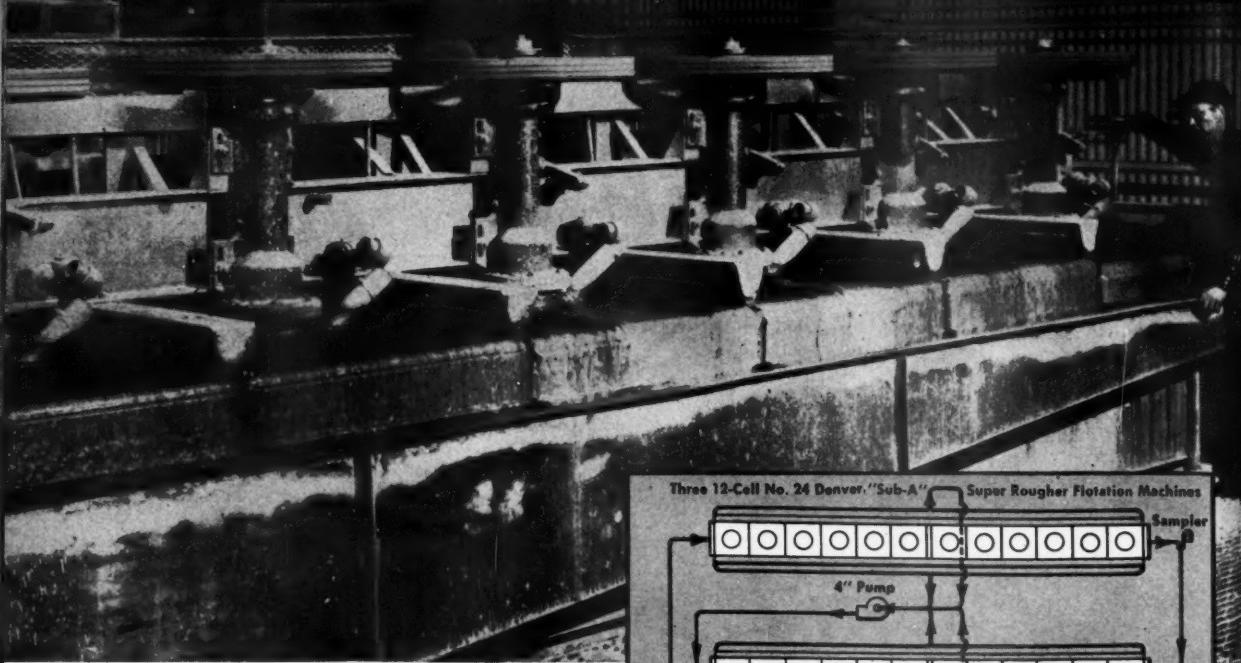
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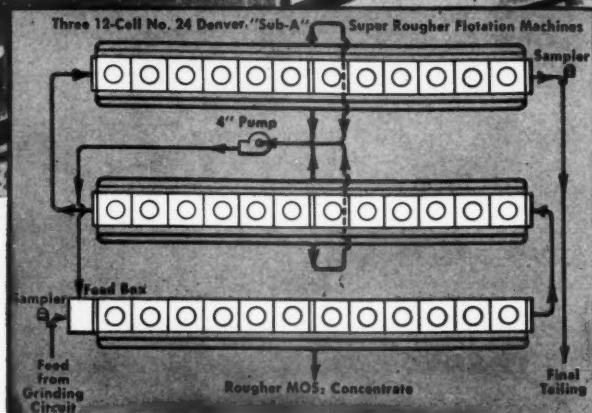


Denver "Sub-A" Flotation Machines are used at Climax to recover "moly."

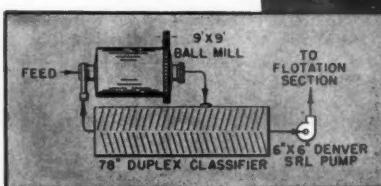
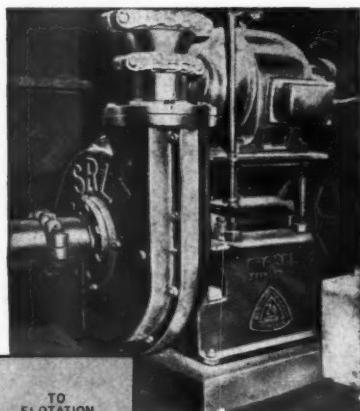
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Sketch shows 36 Denver "Sub-A" Flotation Cells at Climax. Note how flotation feed enters at lower left and flows through all 36 cells. Concentrates from banks No. 2 and No. 3 are returned to bank No. 1 (photo above). Final rougher concentrate is removed from bank No. 1.



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Editorials

JOHN C. FOX, *Editor*

FEBRUARY, 1955

Keeping Score

EACH year the February issue of MINING CONGRESS JOURNAL is devoted to a run-down on what has happened in coal and metal mining and industrial minerals during the preceding year. This Annual Mining Review begins on page 42. Each of the articles has been contributed by a leader in his field and represents the latest informed thinking on matters of moment to mining men everywhere. Here is mining's scorecard for 1954 with predictions on what to look for in 1955.

Engineering and the Future

"THE engineer's practical applications of science have done much to make our American standard of living the highest the world has ever known. He has helped promote our national welfare and security and the health, comfort and prosperity of our citizens. In this technological age, the Nation's need for his service is constantly expanding. His responsibilities become greater every day, and, in spite of manpower shortages, the engineering profession is achieving success in meeting the challenge."

Thus wrote President Eisenhower in heralding National Engineers' Week, February 20-26. Throughout the Nation, the week's events will call attention to the engineer's contributions by means of radio and television broadcasts; at the "open house" programs on the campuses of leading engineering schools and universities, and in special meetings of local, state and national engineering societies.

MINING CONGRESS JOURNAL is proud to add its voice to the swelling chorus of recognition and to point to the pages of this issue as a living example of how the

scientists and engineers of the mineral industry are living up to the theme of National Engineers' Week—"Engineering—Builder of a Brighter Future."

National Minerals Policy

IN our December issue we commented on the Report of the Cabinet Committee appointed by President Eisenhower to offer recommendations for a National Minerals Policy. The Committee made 11 recommendations designed to encourage domestic mining. Four of these would require Congressional action. Approval of the report by the President left the implementing of the other seven recommendations up to the Interior Department.

As a first step, Interior Secretary McKay has established an Office of Minerals Mobilization within the Department, to be responsible for adequate supplies of certain metals and minerals, including solid fuels, and facilities to meet both civilian and military requirements. The new office will be directly responsible to Assistant Secretary Felix E. Wormser and a director will soon be named.

OMM, as the new agency is called, will carry out activities under the Defense Production Act which have been delegated to the Interior Department with respect to strategic and critical metals and minerals including solid fuels. It will cooperate with General Services Administration on tax amortization certificates, stockpiling, and procurement contracts. Its specific duties are outlined on page 149.

The President's budget calls for a staff of 37 persons for the operation of OMM. Some interim funds can be provided, and it is hoped that the new organization will be able to tackle promptly the job of putting the President's recommendations into effect.

Annual **MINING REVIEW**



• Rudolph T. ELSTAD is president of the Oliver Iron Mining Co., a division of the United States Steel Corp. Mr. Elstad joined Oliver as a mining engineer in 1919 and in the ensuing years advanced successively to mining captain, assistant superintendent, assistant to vice-president, vice-president, and was made president in 1946. With this background he reviews iron ore in 1945 in an article beginning on page 47.



• J. E. TOBEY, president, Appalachian Coals, Inc., has been active for many years in engineering and technical societies and in 1950 received the Percy Nicholls Award, the highest award jointly sponsored by the ASME and AIME. He has an intimate knowledge of the coal industry and its problems and drew upon this knowledge to prepare the fine review of the bituminous coal industry beginning on page 49.

• G. DONALD KENNEDY, president of the Portland Cement Association, reveals progress in the cement industry in a penetrating article beginning on page 52. Mr. Kennedy has long been associated with highway development activities in this country. He has served as consultant to several states in development of long-range highway programs, and in 1948 received the George S. Bartlett award for "Outstanding Contribution to Highway Progress."



• LAWRENCE LITCHFIELD, JR., general manager of Aluminum Co. of America's Mining Division, reviews the aluminum situation in a penetrating article beginning on page 56. Mr. Litchfield joined Alcoa in 1925 after a brief period with the U. S. Bureau of Mines. He is president and director of several Alcoa subsidiaries and has authored several articles for the technical press dealing with mining, bauxite and the chemical industry.



• On page 59, our readers are brought up-to-date on anthracite by FRANK W. EARNEST, JR., president of Anthracite Institute. Mr. Earnest's broad experience in the anthracite industry well qualifies him to speak on anthracite affairs. He has directed large anthracite programs on research, advertising, public relations and equipment promotion and has represented the industry on numerous occasions before various governmental committees.

• Review of the sulphur industry this year is presented by LANGBOURNE M. WILLIAMS, president of Freeport Sulphur Co., on page 60. Mr. Williams, among his many other affiliations, is a member of the Business Advisory Council of the U. S. Department of Commerce, chairman of the board of trustees of the National Industrial Conference Board, and a director of the B. F. Goodrich Co.



Mining Congress Journal is proud to introduce the authors of the Annual Review Articles presented in this issue. The year just ended was a critical one and the mining industry is indebted to these men who have reported and analyzed its events.

(Continued on pages 44-46)

• CHARLES R. INCE, vice-president of St. Joseph Lead Co., gives a penetrating review of the lead and zinc mining industry in an article beginning on page 63. Mr. Ince is widely known in lead-zinc circles. He has been associated with St. Joe since 1928. During World War II he served in several government agencies including the War Production Board, and the Industrial Advisory Committee of the National Production Authority.



• The picture in domestic chromite mining is described in the article on page 64 by F. W. LIBBEY, director, Oregon State Department of Geology and Mineral Industries. His mining background includes operating gold and copper properties in Canada and the southwestern United States. He has worked as a consulting mining engineer and, since 1938, has been with the Oregon State Department of Geology and Mineral Industries.

• JOHN GRIFFEN began his long association with the coal industry in the anthracite region of Pennsylvania. There he was instrumental in the development of fine coal cleaning, water clarification and the prevention of stream pollution. Later association with manufacturers of cleaning equipment brought him into contact with bituminous coal preparation. He is now a consultant on coal preparation and on metallurgical coals and coke. His review of coal preparation begins on page 66.



• JAMES P. BRADLEY, vice-president, Bradley Mining Co., reviews the antimony situation in an article on page 65. Mr. Bradley is well qualified to do this review as he has been handling the marketing of antimony and tungsten products for many years for the Bradley Mining Co.

• GEORGE T. HARLEY has been long associated with potash mining. Recently retired as manager of potash mines for International Minerals and Chemical Corp. at Carlsbad, N. M., he is now engaged in private practice as a geological and mining consultant. His review of potash and phosphate in 1954 begins on page 68.



• HELENA M. MEYER, well known in copper mining circles, reviews that commodity in an article beginning on page 71. Miss Meyer began her government service in the Geological Survey and since 1925 has been with the U. S. Bureau of Mines. Currently she is the Bureau's commodity specialist for copper and mercury and assistant chief of the Base Metals Branch. She is author of numerous articles in the technical press and many commodity chapters of the Minerals Yearbook.

Review Authors

(Continued from page 43)



• PAUL R. PAULICK, consulting mining engineer of Library, Pa., outlines advances in coal mine mechanization in an interesting article on page 73. Mr. Paulick has acted as a consultant to mining firms the world over, specializing in ways to improve output with special emphasis on increased mechanization. Knowledge gained from his wide experience serves as a background for this timely article.

• Beginning on page 75, S. H. BOSHKOV discusses recent advances in underground metal mining practice. Mr. Boskrov is now assistant professor of mining at the School of Mines, Columbia University and does consulting on the side. He gained most of his underground mining experience in the east and at one time served the U. S. Bureau of Mines at its oil shale mine at Rifle, Colo.

• DONALD H. McLAUGHLIN, president, Homestake Mining Co., in an article beginning on page 79 reviews the gold situation. Dr. McLaughlin and the gold industry are synonymous. He is at present chairman of the gold producers committee of the American Mining Congress and served as chairman of the Western Division of the American Mining Congress in 1954. He is the author of many articles on ore deposits in the U. S. and South America and on mine valuation.



• Recent advances in bituminous coal research are outlined by HAROLD J. ROSE (left) and JOHN W. IGUE (right) in an informative article beginning on page 92.

Dr. Rose is vice-president and director of research for Bituminous Coal Research, Inc., and a member of the U. S. Bureau of Mines advisory group on synthetic liquid fuels. He is the author of several papers on solid fuels investigations here and abroad. He also holds the Grasselli gold medal of the Society of the Chemical Industry.

John Igoe is technical editor for BCR and is in charge of that organization's publications and technical information. He has a broad background in technical writing and has had much experience in market development.



• A review of strip mining in 1954 begins on page 82. It was authored by JAMES HYSLOP, president, Hanna Coal Co. Division of Pittsburgh Consolidation Coal Co. Mr. Hyslop has worked around the mines as an electrician, a mechanic, a shop foreman, an assistant mine superintendent, mine superintendent, and chief engineer. In 1935 he joined Walter Bledsoe & Company as assistant to the president and in 1937 was made manager of operations. In 1940 he became manager of the Hanna Coal Co., the company which he now heads.





• From his position as vice-president and general manager of Manganese, Inc., F. A. McGONIGLE discusses developments in manganese during 1954 in an article beginning on page 89. Mr. McGonigle obtained his early mining experience in the Coeur d'Alenes of Idaho and in Butte, Mont. He also has managed mines in South America and Canada.



• JOSEPH L. GILLSON reviews industrial minerals in a complete and comprehensive article on page 100. Dr. Gillson is geologist for E. I. du Pont de Nemours & Co., Inc. In the course of his work, he travels far and wide learning at first hand about the many commodities of which he writes.



• Exploration and geology have been ably covered by CHARLES H. BEHRE, JR. (left) and ARMINA F. BANFIELD (right) in an article on page 111.

Dr. Behre is professor of geology at Columbia University and a consulting geologist with Behre, Dolbear & Co. He has taught at various universities, was mineral advisor to the government of Burma and has done consulting geologic work all over the world.

Dr. Banfield is also a consulting geologist with Behre, Dolbear & Co. He has made mine examinations from the Canadian Arctic to the interior of South America and has just returned from Spain. In recent years he has made a special study of surface sulphur deposits.



• E. R. ROWLEY, president of the Titanium Metals Corp. of America, is intimately familiar with the young titanium metal industry. During World War II he operated a magnesium plant in the midwest. Following that he became production manager for National Lead Co. before joining Titanium Metals Corp. His review of the titanium outlook is presented on page 116.



• Safety in the coal mining industry is outlined by M. J. ANKENY in an article on page 120. Mr. Ankny entered coal mining in 1919 starting work as a mine surveyor in Pennsylvania. He joined the U. S. Bureau of Mines in 1928 and rose through the ranks of the Bureau to the position of Chief of the Coal-Mine Inspection Branch. In 1952 he resigned to assume his present duties as Safety Director of the Bituminous Coal Operators' Association.



• An article on tungsten by W. LUNSFORD LONG, vice-president and general council, Haile Mines, Inc., Tungsten Mining Corp. and Manganese Inc., begins on page 127. Mr. Long has been engaged in mining for the past 18 years. Before that he was successful in several ventures and was outstanding in politics in North Carolina. He served several terms in the State Senate and was three times elected president pro tempore of that body. He is also president of The Tungsten Institute.



• The current summary of magnesium, beginning on page 128, is the result of a year-long analysis of the factors, forces and trends which influence the growth of this metal by JERRY SINGLETON, executive secretary of the Magnesium Association. Mr. Singleton has been assistant to the president of the Pressed Metals Institute and prior to that an editor of publications in the paint and office equipment industries.

Review Authors

(Continued from page 45)



- Statistics on the sale of coal mine equipment during the year are set forth in an article beginning on page 130 by W. H. YOUNG and R. L. ANDERSON.

Dr. Young (left) first joined the Bureau of Mines as an economist in the Coal Economics Division. Since 1944 he has served as chief of its Bituminous Coal Section.

Beginning his service in the mining industry with a firm of consulting mining engineers in 1923, R. L. Anderson (right) joined the Government in 1934. Since that time he has been employed by various agencies having to do with coal and at present is a commodity specialist with the U. S. Bureau of Mines.



- WILLIAM J. WAYLETT gained his early mining experience with Anaconda Copper Mining Co. at Butte, Mont. He also spent some time with the Victor Chemical Co. in Butte. He has been associated with the Atomic Energy Commission since 1951 and is now chief of the Technical Services Branch, Division of Raw Materials, AEC. With this background, he has prepared the uranium review found on page 134.

- JAMES IVERS has long been associated with mining in the West. He was governor of the Utah chapter of the American Mining Congress in 1939-1940 and president of the Utah Mining Association in 1948. Until recently he was vice-president and general manager of Silver King Coalition Mines Co. Mr. Ivers has drawn on his long association with the silver mining industry to present the review on silver which begins on page 140.



- S. H. WILLISTON, executive vice-president and director, Cordero Mining Co., reviews mercury in an article on page 143. Mr. Williston has had wide experience in strategic minerals and is chairman of the Strategic Metals Committee of the American Mining Congress. At one time he was chairman of the Alloy Committee, National Minerals Advisory Committee and chairman of the Mercury and Antimony Sub-Committee, Non-Ferrous Metals Advisory Committee to the Munitions Board.



The newly-launched George M. Humphrey carried a record 22,379 long-ton load of iron ore

THE iron and steel industry in the United States will soon complete a program of expansion of steel producing facilities which has never been equaled in its enormity in American industrial life. This program, which commenced about 1940, was financed by private enterprise at a cost of seven billion dollars. This expansion was necessary to meet, during this period, the rapidly increasing need for iron and steel for military use—first, to carry out a successful war against German aggression, and second, to provide a defense for the world's liberty loving peoples against another more menacing danger, that of world wide communist aggression. Upon the military need for steel was superimposed the increased requirements of a growing American economy and the needs of a rising standard of living of our people. The capacity to make iron and steel accordingly rose over 50 percent since 1940. At present American steel furnaces can produce 124,300,000 net tons annually of ingots and steel for castings.

During 1954, steel ingot production totaled about 88,000,000 net tons and the iron ore shipped from mines to steel plants totaled approximately 91,000,000 gross tons. The Lake Superior District continued to maintain its dominant leadership by producing $\frac{2}{3}$ of the total shipments. Of the remaining shipments $\frac{1}{2}$ was imported from foreign sources and $\frac{1}{2}$ was sup-

Outlook for Iron Ore

Lake Superior District Maintained Its Leadership Supplying Two-Thirds of the Iron Ore Shipped

By R. T. ELSTAD

President
Oliver Iron Mining Division
United States Steel Corp.

plied from domestic mines in the eastern, southern and western states.

Because of our past dependence upon the Lake Superior District as the nation's chief iron ore supplier, there has been at times much concern expressed by industry, government and military leaders as to the amount of reserves remaining and their suitability for furnace use. The iron and steel industry, ever alert to its responsibility to meet the needs of its customers, the public, and the nation, began an intensive program about 1945 to supplement its ore reserve holdings by the development of new ore sources both here and abroad.

Taconite Developments

The past 12 months have been full of significant events which have occurred in the development of this

program. Two very important foreign iron ore fields commenced their shipments to American furnaces. The first cargo of ore from the Cerro Bolívar district in Venezuela was unloaded at Fairless Works in January 1954. The movement of ore from Canada's new field in Quebec and Labrador was climaxed by boat loading ceremonies at Seven Islands, Quebec, last July. The development of taconite as a domestic source of iron ore has continued to expand. Erie Mining Co. began its commercial program in Minnesota by the awarding of construction contracts last spring. The Erie project, the second largest taconite enterprise now under way followed closely upon the heels of the Reserve Mining Co. plant which will be the first to produce taconite commercially in this stupendous mineral

development. In addition, Cleveland Cliffs, Jones and Laughlin and Oliver Iron Mining Division of U. S. Steel have made significant strides with their taconite research developments in the Lake Superior states of Minnesota and Michigan. Caland Ore Co., Ltd., selected the Steep Rock deposit in Ontario, Canada, as best suited for an iron ore supply for Inland Steel's furnace operations and commenced a major mine development there late in 1953. Never in the past has a one-year period been so significant in important events which have occurred in development of new iron ore sources.

In the development of economical processes for using taconite, an extremely hard low grade iron bearing material containing 25 to 35 percent iron, 20 years of research in laboratories and experimental work in pilot plants preceded the construction of commercial plants. Before a single ton of commercial taconite ore is produced, it is estimated \$50,000,000 will have been spent in preparatory study and in obtaining basic information about this very difficult raw material and its beneficiation.

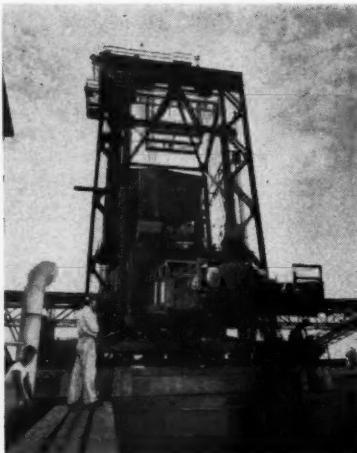
New High Grade Reserves

Discoveries of high grade ore, and this is likewise true of most other mineral deposits, usually occur in remote areas which present almost insurmountable difficulties in their economical exploitation and development. The new iron ore developments have been no exception. To provide production and transportation facilities, huge expenditures were needed.

Transportation of Venezuelan ore from Cerro Bolivar required the construction of 90 miles of rail haulage and the dredging and maintenance of 170 miles of inland waterway as well as loading facilities for ocean carriers. Delivery of Canadian ore from Quebec and Labrador required the construction of a modern railroad 360 miles long over difficult terrain with docks and facilities for loading the ore into ocean and lake carriers. Even Minnesota's taconite will require new railroads to haul the ore to new dock and loading facilities on Lake Superior. Reserve Mining Co. and Erie Mining Co. will build railroads 55 miles long and 70 miles long respectively.

Workers by the thousands are needed to build and operate these new mines, plants and transportation facilities and new communities must be literally carved out of the wilderness, jungle and barren wastes. Community services, other than homes, must also be provided by industry at great costs.

These new mine developments are probably the world's best equipped. The facilities chosen are tailor-made to meet varying conditions, such as prevailing climate, available local



Movement of ore from Venezuela and Labrador began in 1954

labor, efficient mine techniques and modern plant processes. The installations are built for permanence and long life.

Development of these new ore sources will represent an investment of over 1 1/4 billion dollars, exclusive of ore carriers. The present estimate of the newly developed ore reserves is conservatively estimated as 3 bil-

our present domestic ore reserves and permit the conservation of iron ores within our nation's borders to meet any future emergency. The life of our present reserves will be greatly extended. Iron ores will be provided from which steel can be made at competitive costs and in increasing quantities to meet trade requirements for a rapidly increasing population with a rising standard of living.

What then is the outlook for iron ore? Utilization by the American iron and steel industry of the abundant taconite reserves in the Lake Superior district will assure that district a continuance of its major role as a supplier of ore for many years. It will continue to be the nation's first line of defense, even though ores will be imported to an even greater extent in the future.

Despite the challenge of other metals and plastics, iron and steel will continue indefinitely to be the backbone of our nation's economy and industrial future. The new iron ore reserves will be ample for future requirements as the need for iron ore increases. The iron and steel industry continues to be prepared to meet its future with adequate ore supplies. Through its vigorous efforts and large expenditures it has developed these



Past twelve months saw significant developments in taconite programs

lion tons of shipping product of very desirable furnace grade. The full extent of these ore reserves is unknown and many years of experimentation, exploration and development will be required before the magnitude of these reserves is fully known.

National Economy's Backbone

These mining ventures are of great importance to our country's economy and to its defense in case of a national emergency. They supplement

reserves without the use of a single government dollar. This splendid achievement is another fine example of a great industrial accomplishment. It is a tribute to a free American people, living under the flag of a great democracy.





Industrial stockpiles of bituminous coal were reduced approximately 10,000,000 tons during the year

Bituminous Coal in 1954

Production Hit Bottom and Started Back Up. An Output of 425,000,000 Tons Foreseen in 1955

By J. E. TOBEY

President
Appalachian Coals, Inc.

IN 1954, the bituminous coal industry produced in the neighborhood of 392,000,000 tons. Production was about 65,000,000 tons—or 14.2 percent under the 1953 output. Performance in 1953 was of course very substantially under the 631,000,000 tons which was produced and marketed in the boom year of 1947.

The changing market pattern for bituminous coal was further emphasized in 1954. The growth of the electric utility market continued; the use of coal for coking, while off a little, remained a growing market; the loss of the railway fuel market continued, but the total has diminished to the point where this trend is no longer capable of damaging the industry, while changes in other markets were either nominal or a gradual continuation of those previously in effect.

Production Cutting Factors

The severe decline in coal production during the year, while measuring some 14 percent as compared to 1953, does not by any means represent a 14 percent decline in market potential. Three important factors cut the production of bituminous coal in 1954, but it is unlikely that they will have the same influence on 1955 production. These are:

(1) Between October 31, 1953 and July 31, 1954, coal's industrial customers reduced their inventories by almost 20 percent—some 15,000,000 tons. Over the calendar year 1954 the nation's usage of coal represented a draw-down of some 10,000,000 tons from stockpiles.

(2) Coal usage is heavily dependent upon industrial production. The so-called "mild down-turn" of late 1953,

lasting to the middle of 1954, was of serious significance to coal. While the economists tell us that national income and gross national product was off only two or three percent from peak figures, industrial production was off by 10 to 15 percent.

This trend is reversing. October industrial production according to the Federal Reserve Board was only five percent under the same month the previous year, when output was sliding rapidly from its peak reached earlier that year. It now appears quite likely that industrial activity in 1955 will be well above the average in 1954.

(3) Steel production, while a part of any measure of industrial output, is of particular importance to the coal industry, and steel production was off in greater proportion than industrial activity generally. Compared to a 10 or 15 percent decline in general industrial activity, the production of steel ingots was from 20 to 30 percent lower than in 1953. On the basis of a ton of coal for a ton of steel, reduced output in the steel-making industry called for 23,000,000 fewer tons of coal in the first ten months of 1954 compared to the first ten months of 1953. Here, too, the picture recently changed. Steel was produced at a rate 20 percent above that prevailing

in mid-summer and the final quarter-year proved to be the best for 1954. Again, it is hardly likely that 1955 will see a repetition of the depressed levels of the steel industry which were recorded in 1954.

Worst Seems Past

It would appear on the basis of present information that the long market attrition in bituminous coal has run its course and that 1954 was the low year in production for the foreseeable future.

The loss of some 90,000,000 tons since 1947 in railway fuel has about run out the string. Between 1947 and 1954, general industrial use of steam coal has declined some 40,000,000 tons due to industry's turning to the electric utilities and achieving a greater efficiency in their own use of coal—as well as some competition from fluid fuels. No further severe loss of this market appears likely in the next year or two. In 1947 exports exceeded 68,500,000 tons but now seem to have leveled off at 30,000,000 to 35,000,000 tons. The major impact of natural gas has now been felt by the coal industry, and any further loss in this market should be more gradual than the rate which saw retailer deliveries decline some 45,000,000 tons between 1947 and 1954.

From here on in, there is a very good possibility that whatever further declines may occur in the markets for railway fuel and at retail will be offset by growth in the demand from electric utilities, by-product coke ovens, and some gradual and modest gain for export.

During the period of economic stress following 1948, the coal industry has continued to demonstrate its efficiency and progressiveness.

Output per-man-day in 1953 averaged 8.17 tons per man, according to

the U. S. Bureau of Mines. This is several times the average achieved in other coal-producing areas in the world. Since 1939, the national average production per-man-hour in industry had increased 31 percent by 1953. In bituminous coal, this increase was nearly 56 percent.

The transportation of coal away from the mines and to its various markets is likewise undergoing change. In 1950, 5.3 percent of the national production was loaded directly into barges at river points. The tonnage so hauled was 27,500,000 tons. Despite a declining total production, the amount of coal hauled directly from the mines by waterways has continued to grow in tonnage, and of course in proportion. In 1953, 35,600,000 tons were shipped from the mines by water, representing almost 8 percent of the national production.

This of course does not tell the full story as it does not include the coal hauled by rail away from the mines to an interim point for dumping into barges and delivery to ultimate destination by water.

That a better atmosphere exists today for the proper consideration of the problems which the coal industry and the nation face was apparent at the 37th Anniversary Convention of the National Coal Association in Pittsburgh, November 17 and 18. Considerable evidence was presented to show that coal's story as it affects the national security and prosperity is being told in high places.

The convention's featured speaker was Dr. Arthur S. Flemming, Director of Defense Mobilization. At the present time, Dr. Flemming is heading up two top-level committees of considerable importance to the coal industry. One is the Inter-Departmental Committee on the Soft Coal Industry, and the other is the Cabinet Com-



Resurgence of the steel industry will be reflected in an increase in coal consumption

mittee on Energy Supplies and Resources Policy. The decisions and recommendations of these committees are likely to have long-range influence on the progress of coal and the other mineral fuels.

Coal in 1955

Having already mentioned the impact of three factors which have reduced coal production in 1954, and stating that in my opinion they would not apply in 1955, you will not be surprised to learn that most people in the coal industry are expecting an increase in production in 1955. That increase is of course already making itself felt. Weekly production in the last quarter of 1954 ran from 10 to 20 percent higher than the average output during the first nine months. Furthermore, a better demand was reflected in practically all markets. A recent issue of the ACI Bulletin had this to say on the situation: "While there has been little evidence as yet of coal price increases to individual buyers, the market tone is firmer than it has been for many, many months. This should occasion no surprise. Considering the great number of sales that have been made at below cost and at a steadily declining level, it was axiomatic that the downturn had to stop, sooner or later."

"The stronger market has been indicated by higher production in recent weeks. Obviously, this greater output has not been prompted by demand at levels less attractive than those existing a few weeks ago; instead, it reflects somewhat the enhanced opportunity for sales which can be made at levels that will add to average realization.

"It also portends the time when a reduced tonnage will be available at the ridiculous levels at which some coal has moved in recent months."

In each year since 1948, the average f.o.b. mine price on coal produced



Output per-man-day, several times that in other coal producing countries, continues to increase

for the commercial market has shown a decline. Yet in this period the industry has absorbed several major increases in its base cost of production. Wages were raised and the royalty per ton paid to the Miner's Welfare Fund was increased. The base daily rate now stands at \$18.25 per day and the royalty per ton at 40 cents.

It is a measure of the resiliency and growing efficiency of the industry that this terrific impact of costs, coming at the same time that the market price of the product was in a long and severe decline, could be absorbed while still keeping the coal industry in so many of its markets. While the industry on an average probably operated at a loss in 1953 and certainly in 1954, many leading units in the business of producing coal have consistently shown profits.

Therefore it is believed that 1955, with all the constructive measures being taken to help coal, is likely to return the industry to at least a break-even basis on the average, with the possibility of making an over-all profit, and with a certainty that the progressive leaders in the industry will have a better profit year than was the case in 1954.

At the present moment, based on the known factors that will influence production as well as on our estimate of other factors, 1955 production of bituminous coal seems likely to increase to around 425,000,000 tons. This would be about 35,000,000 tons over estimated 1954 production.

Market by Market Analysis

The electric utilities will increase their take of bituminous coal, probably using some 120,000,000 tons in 1955—5,000,000 or 6,000,000 tons more than in 1954. By their steady increase of efficiency, the electric utilities are able to generate the same amount of electricity with from three to four percent less fuel each year. Therefore a growth in electric generation of some

7½ percent next year will call for about 4½ percent more coal.

The steel industry, with its weighty impact on coal demand, is looking up again. Back during the summer doldrums in 1954, steel industry leaders were beginning to express doubts that production would reach 70 percent of capacity in the last quarter. Furthermore, they felt only slightly more optimistic regarding 1955. However, the warm and refreshing impact of new orders in volume has changed all this. The industry operated at near 80 percent capacity in the final months of 1954—some 25 percent above the August lows. Current industry opinion is to the effect that the steel industry will operate at 75 percent of rated capacity well into, if not through, 1955.

We have taken a little more conservative view in our forecast and expect an increased take for by-product ovens, beehive ovens, and in steam coal for steel and rolling mills of some 8,600,000 tons next year as compared to this.

The general industrial use of bituminous coal is also destined to rise a little, perhaps 5,000,000 tons, from 1954 levels. The increase in U. S. industrial production to at least match consumption, with perhaps some rebuilding in manufacturers', wholesalers' and retailers' stocks, should create a considerably better demand for industrial steam coals in 1955 than there was in 1954.

That important segment of the coal industry, the retail dealer, is subject quite naturally to the vagaries of the weather. The weather pattern was not favorable to the sellers of fuel for space heating during most of 1954. Nevertheless, this market absorbs some 57,000,000 tons of bituminous coal in 1954, and always expecting a normal winter to occur, should take at least that much in 1955.

In a year of lower freight carloadings, railroads bought some 17,000,-

000 tons of bituminous coal for locomotive fuel. Most forecasters expect 1955 to result in a larger railroad freight traffic. This will soften the impact of further dieselization and, although there will be some shrinkage, this should result in a railroad fuel buying of some 13,000,000 tons of bituminous coal.

The export market seems to have largely stabilized itself. Exports to Canada and for overseas delivery in 1954 reached some 32,000,000 tons. The outlook for 1955 is for some slight increase in the overseas market and some slight decline in shipments to Canada, just about counter-balancing each other to equal export tonnage in 1954.

As mentioned before, the production of bituminous coal in 1954 was some 10,000,000 tons below actual use and export. This is the amount that industrial users have taken out of stockpiles. On the basis of a rising demand and the prospect of firmer prices in the offing the tendency in 1955 will be to build stocks instead of reducing them.

In summary, 1955 should be marked by three influences:

(1) A better average price at the mines

(2) A better production—some 10 percent above 1954

(3) A better public and government understanding of their stake in the correction of influence depressing the industry

Atomic Energy to Supplement—Not Supplant

A few years ago it was popular to predict that the coming of atomic power would in a few short years eliminate the need for coal and the other conventional fuels and take over the job at practically no cost. Those dreams have proved to be quite an illusion and we are today realizing that the real problem is to develop the techniques of economical atomic power so that it can carry its load by the time that it will be greatly needed. The problem is to develop enough energy from all possible sources to meet the tremendous demand of the future.

This was revealed at the Third Annual Conference of the National Industrial Conference Board on Atomic Energy in Industry in New York, October 13 to 15. More than 2000 industrialists, scientists, engineers, investment bankers, patent attorneys, insurance agents, educators, and persons interested in agriculture and medicine, attended this meeting in which 90 speakers covered practically every important phase of nuclear energy.

In discussing the current outlook for atomic power costs at the New York meeting, W. Kenneth Davis, Deputy Director, Division of Reactor

(Continued on page 62)



Electric utilities are expected to increase their consumption by about 4½ percent in 1955



Portland Cement Industry has set production records each year since 1947

Increasing Use Spurs Demand for Cement

Uses of Portland Cement and Concrete are Constantly Expanded Through Education, Research and Development

ment

By G. DONALD KENNEDY

President
Portland Cement Association

ACCORDING to the Bureau of Mines "Minerals Yearbook, 1951" and "Monthly Cement Reports," the portland cement industry has established new, all-time production records each year since 1947. Production has increased steadily for a full decade. While final figures for 1954 have not been made available, published reports for the 12 months ended September 1954, show that the 157 plants operating in the United States and Puerto Rico reached another all-time peak of production, having manufactured 266,779,000 barrels in this period.

These Bureau of Mines reports also indicate that capacity has been significantly expanded.

In this ten-year period, production has increased by some 163,974,000 bbl., or 160 percent. Production in the 12 months ended September 1954, was 51 percent greater than the highest pre-war year.

Throughout the past year, trade magazines and periodicals have reported large-scale expansion, modernization and development programs under way and planned for the near future. Plans have been announced for construction of three new plants, and major expansion is taking place within existing plants with the addition of kilns, new crushing, grinding and

The Portland Cement Association is a national non-profit organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work. It is supported voluntarily by more than 65 member companies which produce a major proportion of the portland cement used in the United States and Canada.

The Association has nothing to do with the production, distribution, pricing or selling of portland cement, and does not speak for the cement industry on commercial matters. It has nothing to do with trade practices. All production, capacity and industry statistics herein were obtained from regular publications of the United States Bureau of Mines.

blending equipment, quarry development, increased slurry storage and drying facilities, installation of electrostatic dust precipitators and collection equipment, new raw and finish mills, and cement storage facilities.

Year	Plants	Production, Bbl.	Capacity, Bbl.
1945	145	102,804,884	241,631,390
1946	153	164,064,188	241,621,871
1947	150	186,519,347	249,107,218
1948	150	205,448,263	254,272,378
1949	150	209,727,417	258,948,399
1950	150	226,025,849	268,273,305
1951	155	246,022,476	281,532,328
1952	157	249,256,154	282,576,000
1953	157	264,023,000	284,014,000
1954	157	266,779,000 ¹	294,298,000

¹ 12 months ended September 1954.

Through addition of several kilns one plant is increasing its capacity by 1,000,000 bbl per year. Another will expand production by 80 percent. One company through addition of new facilities to two of its plants, will increase capacity by 2,500,000 bbl annually.

Outlook

The U. S. Departments of Commerce and Labor in November issued a construction volume forecast estimating that \$39½ billion of new construction would be put in place during 1955. This is about seven percent higher than the record-breaking volume of \$37 billion estimated for 1954. If the prediction proves true, it will be the ninth successive year that construction activity has established new records.

Among the types of construction which the Commerce-Labor statisticians predicted would show fairly large increases are private housing, hospital, institutional, educational and religious buildings, and highways. Slated to decline are industrial building, farm construction, public housing, railroads and Federal civil works.

Portland cement, as the most widely used of all modern engineering construction materials, cuts across all these types of construction. New applications of concrete and new construction methods have been factors contributing to a growth in the use of portland cement per unit of total construction.

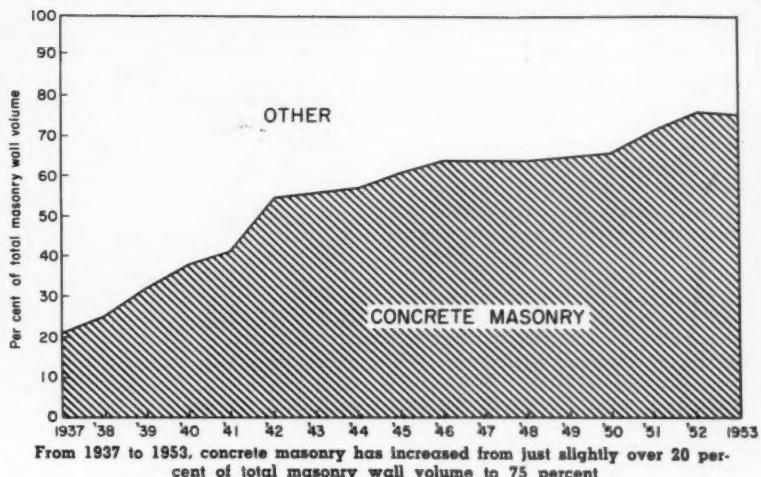
Concrete Masonry: The annual use of concrete masonry, according to the U. S. Department of Commerce, today exceeds the combined wall volume of all other types of unit masonry construction.

Production of concrete masonry units in 1954 has been estimated by one magazine survey at about 1,900,000,000 8 by 8 by 16-in. equivalent units, and by another at approximately 1,950,000,000 units for the year. This represents a very slight six or seven percent increase over 1953 production.

An interesting development in concrete masonry production is the use of high pressure steam curing. In cylinders, or autoclaves, blocks are cured in saturated live steam at about 350° F. Eight new high pressure steam curing plants were built in 1954.

More Light Aggregate

A definite trend in this field is the growing use of light-weight aggregates. Concrete masonry units are regularly made with either heavy-weight aggregates which produce a hollow load-bearing block of 8 by 8 by 16 nominal size weighing from 35 to 45 lb, or lightweight aggregates, which produce a similar size block weighing 25 to 35 lb. An estimate of the National Concrete Masonry Association is that approximately 55 or 60 percent



of concrete masonry today is made of lightweight aggregate.

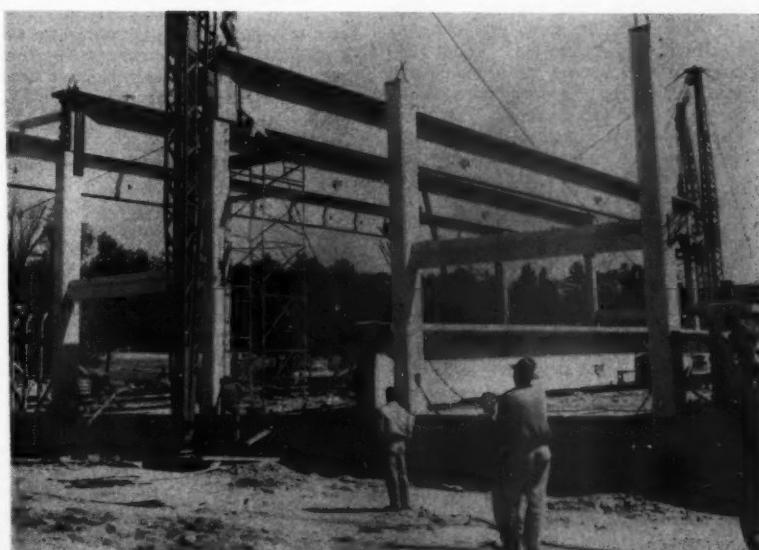
This trend to lightweight aggregate has become noticeable throughout the concrete field where insulation, acoustics, or weight are problems. Lightweight aggregates are also being used in large precast concrete structural units to reduce dead weight. Lightweight "cellular" or "foam" concrete building units have been used for wall panels and roofing slabs abroad for some years. They are now being introduced into this country.

Precast Concrete: This is a rapidly expanding field of cement use of great potential. A survey of precast concrete construction practices in the United States was reported in May 1954, by the Portland Cement Association. It found that some 225 plants were at that time producing precast structural concrete units.

Using More Precast Units

More and more, long-span floor and roof members, girders and columns, exterior wall panels, interior partitions, and various types of bridge elements are becoming plant-made items. One precasting plant making a prestressed floor and roof plank had a volume of about 4,000,000 sq ft. Another, producing only short-span, channel-shaped roof units manufactured about 5,000,000 sq ft.

At Miramar Naval Air Station (Calif.), wall, floor and roof panels of the same design were fabricated at a plant over 100 miles from the site. Wall panels with insulation material placed between two concrete layers—the so-called sandwich panel—are manufactured in factories and delivered to installations many miles away. At the Electrometallurgical Co. in Marietta, Ohio, over 3000 sq ft



Longest prestressed concrete girders used thus far in the United States had a 118-ft span

of such wall panels were erected per day.

Besides individual structural elements, some plants today are furnishing all the components of a building shell as a complete package, including interior and exterior columns, prestressed girders, roof decks and wall panels.

At the Marine Corps Artillery Training Center at Twentynine Palms, Calif., 117 buildings were built using precasting methods to reduce costs and speed operations. Nearly 6000 thin-wall roof panels were mass-produced. Wall panels were precast on the floors of the 76 barracks buildings constructed, and lifted into place with vacuum lifters. Nearly 90,000 tons of precast units requiring about 100,000 bbl of cement were handled on this one project.

In bridge construction, where large numbers of similar units are required, precasting is an effective answer. In Lower Tampa Bay Bridge, nearly 2200 prestressed concrete stringers spanning 48 ft were precast at one yard, while deck sections were precast at a second yard. Forty-five thousand bbl of cement were used for these precast elements. In the bridge carrying U. S. 90 from Bay St. Louis to Henderson Point, Miss., more than 40 miles of precast concrete piles and 482 roadway or deck slabs weighing 122 tons each were precast. A total of 119,000 bbl of air-entraining portland cement was used in this work.

Tilt-Up, Lift-Slab Construction: A recent precast development gaining favor is the lift-slab method of construction. In this system, the roof and upper floors of a structure are cast on the base slab, one on top of the other in layers, around supporting columns. Jacks are then mounted on the tops of the columns and used to lift the roof and floors into final position. Matching steel rings in slabs and columns are then welded together. From 1950 through 1953, some nine firms had been licensed by the developers to utilize this patented method. Ten were licensed in 1954 alone. A similar type of precasting operation utilizing hydraulic lifting devices was also used in 1954.

Tilt-up construction is another relatively new form of precasting that has become an accepted method of wall construction in most sections of the country. Developed in the thirties, it has come into its major use in the past decade. In the process, walls are cast on a horizontal base . . . usually the floor of the building under construction . . . then tilted into position with power equipment, and fastened together at corners or between panels with cast-in-place concrete columns. Metal clips, clamps and welding may also be used to fasten units together or to columns.

Tilt-up is especially advantageous for large one-story buildings. For ex-

ample, walls for 29 acres of warehouse near Washington, D. C., were cast flat on the floor, and a mobile crane moved down the "assembly" line tilting them into position. The largest wall panels lifted to date, it is believed, are 32 by 36 ft, weighing close to 40 tons. Development of mobile power lifting equipment has been a great stimulant to this type of construction.

Prestressed Concrete: Prestressed concrete is coming into its rightful place as a construction medium and as a highly useful adjunct to reinforced concrete.

In prestressed concrete, the reinforcing steel usually consists of steel cables. These are stretched so as to superimpose compressive stresses in the concrete. These stresses eliminate or greatly reduce the tensile stresses to which unsupported portions of bridges and buildings and the walls of tanks and pipe are subjected. Prestressing permits the building of concrete bridges, roofs, floors and struc-

girders used thus far in building construction in the United States—118 ft clear span—were put into place at the Senior High School gymnasium at Greensboro, N. C.

An interesting use of prestressed members was in the Glenn L. Martin Co. office building addition in Baltimore. Full-height precast concrete columns were used with precast prestressed girders in multi-story construction.

There are some 44 firms producing precast, prestressed concrete structural units today, and the number is increasing rapidly.

See Big Highway Boom

Highways: The Federal-Aid Highway Act of 1954 provides for an approximate 50 percent increase in federal-aid highway funds to the states: \$875,000,000 in each of the fiscal years 1956 and 1957. In addition, in July Vice President Nixon revealed President Eisenhower's \$50 billion ten-year highway program proposal. This pro-



Placing of concrete in floor sections is becoming a highly mechanized operation

tural members for longer unsupported spans, and the construction of concrete pipe and tanks to withstand even greater internal pressures.

Indicative of its rapid growth is the fact that the first prestressed concrete bridge in the United States was completed in 1950 (in Madison County, Tenn.). The first major prestressed bridge was opened only four years ago when the Walnut Lane Bridge was completed in Philadelphia. Since that time, approximately 50,000 ft of prestressed concrete bridges have been built in the United States. More than 21,000 ft were constructed in 1954 alone.

A recent big project was the construction of 12 prestressed concrete bridges on the Garden State Parkway, New Jersey. The bridges, with spans varying from 39 to 60 ft in length, were built of 218 prestressed beams fabricated in a prestressing factory.

The longest prestressed concrete

gram calls for expenditure of \$50 billion for roads and streets in addition to current levels, and would double the rate of highway expenditures to an estimated \$100 billion in the next ten years. A large portion of this expenditure would be for improvement of the National System of Interstate Highways, the nation's main heavy-duty road system of 40,000 miles.

The mileage of toll roads—also heavy-duty pavements—has increased greatly in recent years. At the end of 1954, the mileage under construction, or soon to be built, was nearly 4½ times the total toll road mileage constructed in the entire automotive history of the United States. Of 2543 miles completed or under construction at that time, about 1880 miles or 74 percent were concrete. On rural sections of primary state highways, 44 percent more concrete has been used than other types of paving material. Eighty percent of rural expressways and 78 percent of urban expressways are concrete.



Increasingly heavy gross weights and wheel loads, plus the ability to withstand jet blasts, require heavy duty pavement of great strength and durability

Relatively new advancements in concrete highways, such as air-entrained concrete to eliminate pavement scaling, and granular subbase to prevent "pumping," have extended the service life of concrete pavements and improved their performance. These improvements plus past good experience indicate heavy demand for cement in the highway field in the next decade.

According to data compiled by the Bureau of Public Roads, about 38,000 miles of roads and highways were completed in 1954. This represents a 30 percent increase over 1953. A further increase is expected in 1955 when an estimated \$4.6 billion will be spent for 46,000 miles of road and street construction. The joint Commerce-Labor estimate is for an 18 percent increase in roadbuilding.

Soil-Cement: In 1935, soil-cement was for the most part still an idea being developed into reality by scientists and engineers of the Portland Cement Association. In 1940, there was less than 10,000,000 sq yd. Today, in excess of 125,000,000 sq yd of soil-cement has been placed, including more than 6000 miles of rural highways and some 2200 miles of streets. Soil-cement has been used for airport pavement, reservoir, ditch and canal linings, embankment slopes, dam facings, road shoulders and for other purposes. (More than 2,000,000 sq yd of soil-cement subbase for concrete pavement was placed in 1954, for example, a relatively new use.)

A tightly compacted combination of soil, portland cement and water, which forms a strong paving material as the cement hydrates and solidifies the mixture, soil-cement has been used in 46 states. Its growth has been speeded by improved construction equipment and field and laboratory research.

Airfield Paving: Today's airfields, particularly military airfields, must be built to much higher standards than ever before, to carry safely to-

day's much heavier wheel loads and gross weights. Jet blast, fuel spillage and high pressure tires of modern jet aircraft can play hob with many paving materials. But condition surveys of concrete pavements have revealed no damage due to these causes.

As a result of concrete's performance under jet plane operations, and such factors as high visibility, ease and low cost of maintenance, concrete pavement contracts awarded in 1954 for airfield construction was 67 percent greater than in 1953. To mid-December 1954, 16,592,862 sq yd of concrete airfield pavement had been awarded . . . mostly military and naval construction.

Thin Shell Roofs: Reinforced concrete thin shell roof construction has undergone its major technical development in the United States since World War II.

Shell roofs can be described as thin concrete slabs curved in either one or two directions, the curvature imparting great load-carrying capacity for the thinness of the shell. Shell

roofs are finding popularity in use for gymnasiums, aircraft hangars, and industrial and commercial buildings requiring large amounts of clear floor space.

An example is provided by twin hangars built at Chicago Midway Airport. Each has a floor area of 45,000 sq ft, covered by a concrete shell roof with a span of 257 ft and a clear ceiling height at mid-span of 60 ft. Yet the shell of each is at most points only 3½ in. thick. A more recent thin-shell hangar at this same airport has a span of 265 ft.

In 1954, conferences and courses were held at leading engineering colleges on thin shell design. A new American Society of Civil Engineers manual on shell roof design has also served to increase interest in this type of construction, which should continue to grow in use.

Accident Trend Downward

All-time low injury frequency and severity rates were set in 1953 by member company plants of the Portland Cement Association, and the trend of accidents continued downward in 1954.

The safety programs conducted by member companies in 152 operating units in 1954 are coordinated and given over-all leadership by the Association's Accident Prevention Bureau, which cooperates with national and local safety organizations.

Reports from the first six months of 1954 show that the number of disabling injuries per million man hours had dropped to 3.27, 10 percent below the first six months of last year. The severity rate of injuries was 0.8 days lost and charged per thousand man-hours, 39 percent below 1953. Mine and quarry operations were safer than ever before. The National Safety Council's award for outstanding performance has been won by the Association twice in the past three years.



In Tilt-up construction, concrete panels are cast flat and tilted up into final position



Bauxite deposits in Arkansas furnish about one-sixth of the 8,000,000 to 9,000,000 tons of ore required by United States producers of primary aluminum metal

Outlook for Aluminum

Mushrooming Expansion of Producing and Fabricating Facilities Will Continue Far into Foreseeable Future

By LAWRENCE LITCHFIELD, JR.

General Manager
Mining Division
Aluminum Company of America

IN THE business of producing metals, whether they be aluminum, steel, magnesium, copper or zinc, we are all striving to present the consumer with the perfect metal. This perfect or ideal metal is an alloy that is lighter than magnesium, stronger than high strength steel and more corrosion resistant than aluminum. The perfect metal would maintain its strength at about 5000° F. and should be easy to work and machine. At the same time, it should sell for about five cents per lb.

As ridiculous as this "utopian" metal sounds at the moment, it is the Holy Grail for which metal producers are continually searching. Each attempts to produce his metals and alloys with improving properties at lower prices. Aluminum provides an excellent example of how a metal has undergone this metamorphosis. The other light metals, such as magnesium, are just beginning this transition.

With the birth of the aluminum industry in 1888, aluminum was a corrosion-resistant lightweight metal that

had good heat and electrical conductivity. Strength, however, was not one of aluminum's principal advantages; and its cost wasn't competitive with steel, zinc or copper. By introducing new and better aluminum alloys, improving production methods and lowering costs, aluminum has progressed from the status of a rare metal to the material whose domestic production is exceeded only by steel.

Primary production of aluminum bounced from 2500 tons in 1900 to 163,500 tons in 1939. With the overpowering demand for aluminum during World War II for the war machine of the allied powers, primary aluminum production jumped to a wartime peak of 920,000 tons in 1943. Production dropped off sharply from this peak, but after 1946 output rose again as civilian consumers began to appreciate the metal's capabilities. Growing peacetime demand, plus outbreak of the Korean War, resulted in further expansion of production facilities. By 1952, approximately 937,000 tons of aluminum were produced, nearly six

times the production level of 1939. Expansion continued during 1953 when about 1,250,000 tons were produced; and in 1954 about 1,450,000 tons of aluminum were siphoned from the nation's pot lines.

Research Improved Product

This growth of aluminum has been made possible by the accompanying improvement in aluminum alloys and methods of fabricating and using them. From the very beginning, the aluminum industry has been extremely research conscious. Alcoa, for example, was actually founded upon a major research discovery by Charles Martin Hall. His discovery of an inexpensive way to separate aluminum from its ores was the keystone of the company's foundation. With this major development as its starting point, the research facilities of the light metal industry have grown to be the largest and most comprehensive of any of the world's metal producing industries; and some of them were functioning long before many manufacturers had even heard of an industrial research laboratory.

Today, the research scientists of the nation's aluminum producers are engaged in a continuing study aimed at bringing aluminum closer still to the perfect metal referred to above. Improvement in aluminum's physical properties since 1888 illustrate the job that can be done by research. Using

improved alloys, the designer can achieve tensile strength higher than 80,000 psi whereas at the turn of the century he was limited to about 30,000 psi. Other alloys have been developed to offer better fatigue strengths, better corrosion resistance, better electrical conductivity, and hundreds of other improvements which make the metal more competitive on the American markets. In addition, research along with improved equipment and large scale production has helped lower production costs so that the metal can be sold in pig form at close to 20 cents per lb compared to a price of \$8 per lb in 1888. These price figures are even more impressive when one notes that during this same interval the price of steel tripled and the price of copper more than doubled.

Ore Demand Zoomed

The mushrooming growth of the light metals has brought about an exhaustive search for the principal raw materials for aluminum which are bauxite and electric energy. The total bauxite requirements for aluminum manufacture in the United States and Canada are today between 8,000,000 and 9,000,000 tons per year. Of this amount, domestic deposits in Arkansas are furnishing about one-sixth. This means that the aluminum industry of North America must continue to be heavily dependent on imported bauxite. The essentiality of imports has been recognized by our Government first in the bauxite stockpiling program and quite recently in the removal of the import duty from foreign bauxite. The Western Hemisphere, namely North and South America and the Caribbean Islands, is fortunate in its reserves of bauxite. In the United States, reserves of high-grade ore are extremely limited, so much so as to be almost insignificant in the long range picture. Even the reserves of medium-to low-grade ores currently being used in Arkansas by the two alumina plants located there are limited and can be efficiently used with maximum extraction of alumina only in plants specially designed and constructed for that type of ore.

However, in South America the reserves of high-grade ore in British Guiana and in Suriname are well known and should last for many years at the current rate of consumption. These two countries furnish the bulk of the ore for aluminum manufacture on the North American continent. Brazil also has substantial reserves of bauxite not too well located, however, for competitive use in North America. Finally, the last 10 years have witnessed the identification of very large reserves in Jamaica, which are now being actively worked by Aluminium, Ltd., Reynolds Metals Co. and Kaiser Aluminum and Chemical Corp. In addition, Reynolds is developing its concessions in Haiti and Alcoa is doing

the same in the Dominican Republic. Both of these countries contain substantial reserves of bauxite similar in type to that of Jamaica. Quite recently, French Guinea in West Africa has joined the list of bauxite suppliers for North America.

Experiment With Other Ores

While bauxite is the only ore being used at present in the manufacture of aluminum, a great deal of research has been carried on since World War I on the extraction of alumina from other materials such as high alumina clay and anorthosite. It has been pretty conclusively established that it is technically feasible to extract alumina of acceptable grade from these materials. The over-all cost picture, however, defers their use under what I might call normal conditions to the distant future.

Electric Power a Problem

Another vital raw material for the production of aluminum, electric power, presents a more formidable problem. One of the keys to profitable aluminum production is cheap electric power. The electric energy that frees aluminum from its oxides in the electrolytic pot lines is the most unpredictable of the many cost factors in aluminum production.

For many years, the basic source of the electricity for aluminum was the nation's hydroelectric resources. In recent years, however, sufficient low cost hydroelectric power has not been available to meet demand. Consequently, domestic producers have turned to natural gas and lignite as an energy source for the needed electricity. Until 1950, the aluminum producing plant at Jones Mills, built by Alcoa during World War II, was the only aluminum smelter not using hydroelectric power. Since then, Al-

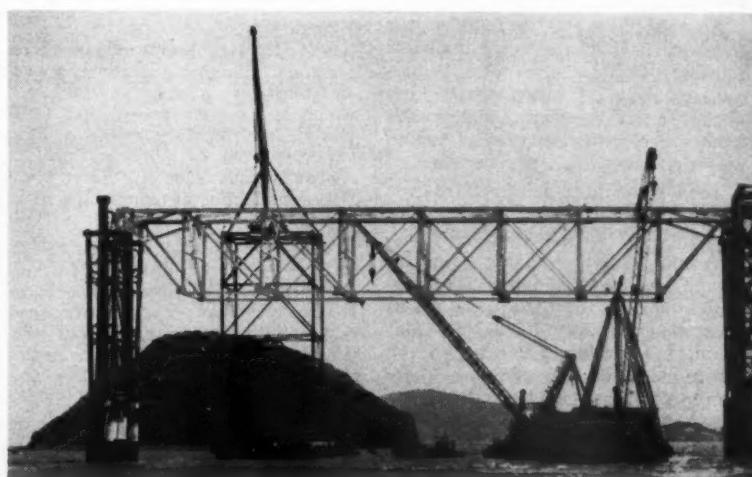


This 22-story New York office building is only one of more than 100 being built or planned, using aluminum curtain wall construction

coa's Point Comfort, Tex., works and Kaiser's Chalmette, La., works and Reynolds' Corpus Christi, Tex., plant have joined Jones Mills in using natural gas as fuel to generate electricity.

The importance of these new power sources is witnessed by the fact that hydroelectric power, which in the '30s operated 100 percent of the nation's aluminum producing pot lines, now supplies juice for only 58 percent. Energy from natural gas combustion generates electricity for 35 percent of the nation's aluminum and energy from burning lignite supplies power for 7 percent of the nation's aluminum capacity.

The aluminum industry will continue to be interested in cheap power from any source.



Aluminum erection-truss serves as falsework during erection of permanent steel spans on bridge over San Francisco Bay

The aluminum industry has turned its attention to power sources in southwestern and northwestern Canada. We are all familiar with the development at Kitimat by the Aluminum Company of Canada, one of the outstanding engineering accomplishments of our times. More recently, two American companies have shown interest in remote power from northwestern Canada which has been studied from the standpoint of generation both in Alaska and in Canada. Whatever the final disposition of this power, the aluminum industry will probably be a user.

A Shining Future

The future for aluminum seems as bright as the metal itself. Old markets continue to grow and new ones crop up at a very healthy rate. The architectural uses of aluminum, for example, have captured the imagination of the nation's architects and the results are everywhere at hand.

Starting with Alcoa's bright office building in Pittsburgh, over 100 multi-story buildings are being built or planned using an outer curtain wall of aluminum. It is well within reason to expect that in the near future as much as 25 percent of the aluminum produced will be sold to the architectural markets.

Another big and growing market for aluminum is the transportation industry. All U. S. automobiles have aluminum pistons, and many of them have automatic transmission assemblies from castings of aluminum, with an increasing use of aluminum trim, and many engine parts.

Most of the truck trailers on the road today are made of aluminum from wheels to roof; and the bodies produced for smaller trucks are following suit.

As air travel increases, so does the aluminum sold for aircraft building.

Another big market is found in the electrical field where aluminum cable reinforced with steel carried 90 percent or more of the nation's high voltage electric power. Smaller aluminum conductors have begun to find use in all sizes of electrical wiring.

These pyramiding markets are even more impressive when one realizes that until the Korean War ended, development of civilian markets for aluminum was stymied by military demands. With the lifting of these restrictions, civilian demand for aluminum has continued at a high level. Where this will lead is indicated by the report of the President's Materials Policy Commission which states that 4,500,000 tons will be consumed annually by 1975. And the American economy continues to outrun the best of predictions.

Growth Will Continue

The growing markets and promising future for aluminum should result in a continuation of the industry's leap-frogging growth.

With the giant expansion of basic aluminum production, there has been an equally big growth of fabricating facilities among aluminum producers. Capacity for rolling, extruding, casting and forging the light metal has been drastically increased; and this trend continues today. Alcoa, for example, put into operation this year a giant rolling mill for aircraft tapered sheet and plate, Reynolds is installing a similar mill. Kaiser recently announced plans for a big new plant for rolling aluminum near Ravenswood, W. Va.

The U. S. Air Force Heavy Press Program is expanding industry facil-

ties and agreement to purchase metal from new plants for stockpiling. Two rounds of government encouraged expansion are nearing completion; and are giving the industry its fourth producer of basic metal—Anaconda Aluminum Co. Construction is progressing rapidly on Anaconda's first smelting plant near Columbia Falls, Mont. This new producer will provide 52,000 tons of aluminum annually, using power from nearby Hungry Horse Dam.

New production capacity of the first and second rounds of expansion total approximately 675,000 tons. This includes, in addition to expansion of existing plants, Alcoa's new Rockdale works with 90,000 tons; Kaiser's Chalmette, La., plant with 200,000 tons; Reynolds' Corpus Christi, Tex.; plant, 80,000 tons, and Reynolds' Arkadelphia, Ark., plant, 55,000 tons.



British Guiana and Suriname furnish the bulk of the bauxite for North American aluminum manufacture

ties for big light metal extrusions and forgings. This program includes several extrusion presses, the largest of which can apply a pressure of 14,000 tons. Giant forging presses as large as 50,000 ton capacity will go into operation shortly at Air Force plants leased and built by companies in the industry.

These are only the highlights of the huge expansion of aluminum fabricating facilities. Not even mentioned are the growing number of manufacturers making light metal parts and products. These independent fabricators number over 20,000, according to a recent survey.

Growth of facilities for production of basic aluminum is continuing at an equally rapid pace. Since World War II, government agencies have encouraged expansion by tax amorti-

ties and agreement to purchase metal from new plants for stockpiling. Two rounds of government encouraged expansion are nearing completion; and are giving the industry its fourth producer of basic metal—Anaconda Aluminum Co. Construction is progressing rapidly on Anaconda's first smelting plant near Columbia Falls, Mont. This new producer will provide 52,000 tons of aluminum annually, using power from nearby Hungry Horse Dam.

While the recent cancellation of government encouragement for an announced third round of expansion may remove one of the incentives for immediate construction of new plants, it will certainly not halt future expansion. At Alcoa, for example, the present inability to get Canadian power rights needed for a proposed Alaskan smelting plant will not interrupt its efforts to increase production and markets.

Still further headlines can be expected concerning expansion projects of the producers of light metals. The aluminum industry is possibly the most dynamic and promising segment of the metals industry today. This condition will certainly endure as long as light metals producers can keep supplying more consumers with the material that best fits their definition for the perfect metal.

Anthracite In 1954

Consumption of Domestic Sizes Greater Than Production in Year Which Showed a Decrease of 11.7 Percent in Output from 1953

By FRANK W. EARNEST, JR.
President
Anthracite Institute

COMMERCIAL production of all sizes of anthracite, including nonunion production, approximated 26,110,000 tons in the calendar year 1954. This represents a decline of 3,460,000 tons or 11.7 percent from 1953. However, consumers in the United States and Canada purchased an estimated 1,435,000 tons more of the domestic sizes than the industry produced in the twelve months ended October 31, thus substantially reducing the available inventory above ground.

The decline in production is attributable to the continued competition of domestic and imported fuel oils and natural gas, together with a subnormal heat demand in the first half of the year. The fall and early winter averaged about normal. For the year as a whole, the heat demand was about five percent less than normal, although somewhat greater than in 1953.

Employment Down 28 Percent

Preliminary estimates indicate that average employment will approximate 41,400 men, a reduction of 16,100 men or 28 percent from the average in 1953. This reflects, in addition to the adverse market factors mentioned, the curtailment or suspension of mining in some high-cost operations in the interest of economy and efficiency.

As this is written, the Cabinet Committee on Energy Supplies and Resources is submitting its report to the President. While the contents of the report are not known, it is anticipated it will demonstrate that the security and economic future of this nation are predicated upon the maintenance of a healthy coal industry. It is hoped that the time is fast approaching when a national fuel policy will be adopted.

Governors' Fuel Conference

One of the hopeful signs of recognition on the part of government officials of the importance of the coal industry to the nation was the formation of the Governors' Fuel Conference. Spearheaded by Pennsylvania's Governor Fine, governors from ten and representatives of six others of the

nation's coal producing states held an organizational meeting of the Governors' Fuel Conference in Washington on April 28, and a second meeting at Lake George, New York, on July 14. The group called for a further conference of governors, senators and representatives of coal producing states to be held in Washington immediately after the 84th Congress convenes.

Coal associations, the United Mine Workers of America and eastern railroads joined in supporting the Hunt Bill, which would amend the Natural Gas Act to give the Federal Power Commission authority to curb imports of foreign natural gas in instances where such imports would result in "economic dislocation, unemployment, or injury to competing fuel industries."

FOA Purchases

In August, Director Stassen of the Foreign Operations Administration announced that 10,000,000 tons of United States coal would be shipped overseas during the fiscal year 1955. During 1954, FOA financed the purchase of only 28,000 tons of anthracite under this special program. The possibility of FOA's achieving its announced objective of exporting sizable amounts of either anthracite or bituminous coal during the next six months depends entirely upon the availability of sufficient funds to operate the program.

Exportation of coal under a government program is one way of giving badly needed assistance to the coal industry. It is apparent, however, that special legislation is needed to insure such a program being of real help to the industry.

Oil Imports Felt

Unrestricted importation of foreign residual fuel oil continued to plague the American coal industry. The extent of this unfair and unregulated foreign competition approximated 59,000,000 tons equivalent of coal. This competition is particularly harmful to the anthracite industry since the bulk of such imports is received in northeastern coastal cities in the very heart

of the anthracite market. It is sincerely hoped that Congress will take steps in 1955 to eliminate this unfair competition.

Hopes of the industry that the Federal Government would provide financial aid in a mine drainage program were dashed, at least temporarily, by the announcement in late November that the United States Bureau of Mines could not legally allocate funds for such a project and that funds could be obtained only by an appropriation of Congress.

On the Brighter Side

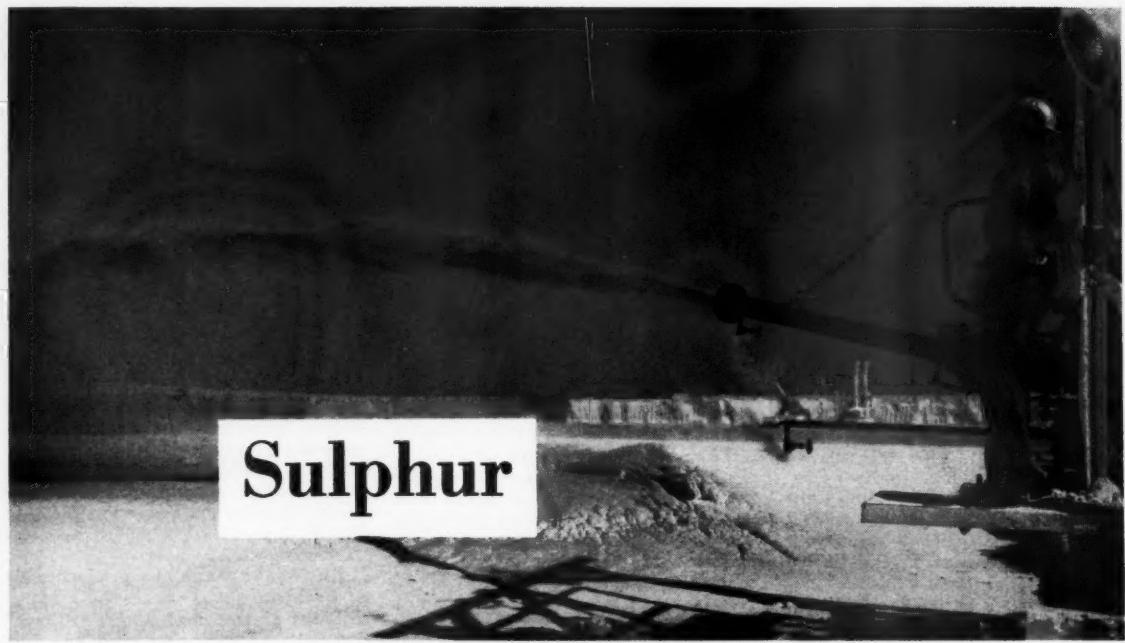
A bright light in the marketing of anthracite is the increasing consumption of anthracite by the industry's largest consumer, the electric power generating industry. During the five coal years ending on April 1, 1954, the average consumption was almost double that in the five years prior to World War II—3,637,000 tons compared to 1,890,000 tons.

During the year a new product made of anthracite was successfully introduced to the market. "Bonnie Burns" Briquets, an improved packaged fuel for grilling, broiling and barbecuing, developed by Anthracite Institute research and being manufactured and marketed by the Philadelphia and Reading Coal and Iron Co., gives promise of gratifying national sales during 1955.

The industry publicity and public relations campaign sponsored jointly by producers and retailers embarked on its second year of activities during 1954. The Anthracite Information Bureau, through news stories, equipment exhibits, engineering services and speaking engagements, continued the campaign to promote the use of anthracite and anthracite equipment. During December, at the request of the Department of Commerce, the Anthracite Information Bureau conducted a series of exhibits in Washington to demonstrate modern anthracite-burning equipment to the various governmental departments which specify fuel and fuel-burning equipment. It is believed that these exhibits will be helpful to the future use of anthracite in government buildings.

Research on anthracite was continued by the United States Bureau of Mines at the Federal Laboratory, Schuylkill Haven, Pa., and also at the Pennsylvania State University, where a program jointly sponsored by the commonwealth and anthracite producers is carried on. In addition, several producing companies are conducting sizable research programs.

While fully aware of the many problems it must face in 1955, including continued and vigorous competition from competitive fuels, the anthracite industry also recognizes certain favorable factors which may very well bring about improved conditions during 1955.



Sulphur

Enough sulphur was produced in 1954 to meet all demands

BIGGEST YEAR IN HISTORY SEES ALL DOMESTIC AND FOREIGN DEMANDS FILLED

By LANGBOURNE M. WILLIAMS

President
Freeport Sulphur Co.

IN 1954 the U. S. sulphur industry produced the largest amount of sulphur in its history and supplied in full all the demands placed upon it by domestic and foreign consumers of this widely used raw material.

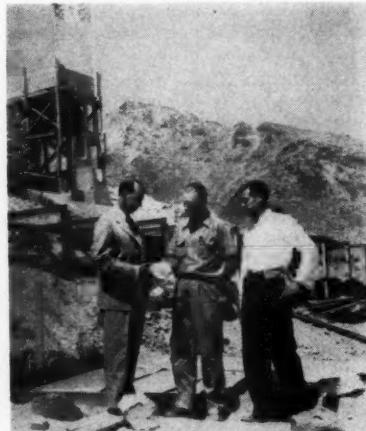
The year was marked also by the near completion of a broad program of efforts on many fronts to increase productive capacity of sulphur in various forms. This expansion program has been under way for some five years and has increased the nation's sulphur productive capacity to an all-time high.

Output of sulphur from all sources in 1954 reached an estimated 6,600,000 long tons, about 350,000 tons more than in 1953. Of this, the great bulk was elemental sulphur, or brimstone, mined by the Frasch hot-water process from salt dome deposits, and the balance was sulphur in various forms obtained from a number of other sources.

Domestic consumption of sulphur continued high, paralleling general business activity. The pattern of consumption by industries remained relatively unchanged. About four-fifths of the sulphur consumed was

converted into sulphuric acid, while the remainder was used in elemental form or in other chemical compounds. The sulphur, in one way or another, was then employed in the production of a great variety of industrial products.

Exports of U. S. sulphur to foreign



Part of sulphur production came from near-surface deposits

countries increased substantially over the previous year. On the basis of figures for ten months, it is estimated that exports for the year approximated 1,600,000 tons compared with 1,242,000 tons in 1953. The United Kingdom and Canada received the largest amounts; other major recipients included France, Australia, New Zealand, Brazil, the Union of South Africa and Belgium.

THE PRODUCTION RECORD

The 1954 production record was established mainly as a result of an increase in production of sulphur by the Frasch process to an estimated 5,450,000 tons, about 300,000 tons more than in 1953. The Frasch sulphur came from 13 mines in Texas and Louisiana operated by five companies.

Boling dome of Texas Gulf Sulphur Co., the largest sulphur producer, continued to be the leading mine. Next came Grande Ecaille of Freeport Sulphur Co., followed by Garden Island Bay, another Freeport property. Located at the mouth of the Mississippi River, Garden Island Bay began operating late in 1953 and produced in excess of 500,000 tons in its first full year. Another new mine, Freeport's small Nash property, was put into operation in February.

An important Frasch process development, although not a part of the U. S. activity, was the start of sulphur production on the Isthmus of Tehuantepec in Mexico. This marked the first use of the Frasch process outside of the United States. Mexi-

can Gulf Sulphur Co. began production at San Cristobal dome in March, and Pan American Sulphur Co. at Jaltipan dome in September. In addition, Gulf Sulphur Corp. announced plans to build a Frasch process mining plant at Salinas dome.

U. S. production of sulphur in various forms from other sources increased slightly in 1954 to an estimated 1,150,000 tons. This included sulphur recovered from sour natural gas and oil refinery gases, sulphur taken from surface deposits, the sulphur content of pyrites, and the sulphur content of gases at copper, zinc and lead smelters.

Among the projects completed in 1954 to obtain sulphur from non-Frasch sources were undertakings of Columbia Carbon Co. at Seminole, Tex., and Phillips Chemical Co. at Eunice, N. M., for the recovery of sulphur from sour gas; a project of Anaconda Copper Mining Co. to expand pyrites output at Anaconda, Mont.; and operations of Eagle-Picher Mining and Smelting Co. at Galena, Kans., and Bunker Hill and Sullivan Mining and Concentrating Co. at Kellogg, Idaho, to utilize smelter gases.

Five Years of Expansion

These 1954 developments were part of the series of efforts begun about five years ago to increase U. S. sulphur productive capacity. While the sulphur industry has always conducted exploration and while some of the new production efforts were started before the Korean war, the increase in sulphur demand that followed the outbreak of the war provided further impetus for this expansion program. As a result of the program, the number of Frasch pro-

Form of Sulphur	TABLE I U. S. Production of Sulphur in all Forms (long tons)		
	1952	1953	1954 (estimated)
Brimstone:			
Frasch process	5,293,000	5,155,000	5,450,000
Brimstone from gases, etc.	250,000	375,000	400,000
	5,543,000	5,530,000	5,850,000
Other Sulphur:			
Sulphur in pyrites	419,000	380,000	400,000
Sulphur in gases	320,000	333,000	350,000
	739,000	713,000	750,000
	6,282,000	6,243,000	6,600,000

Type of Use	TABLE II U. S. Sulphur Consumption Pattern	
	Percent of Total	
Sulphuric Acid Uses:		
Fertilizers	33	%
Chemicals	18½	
Titanium and other pigments	7½	
Iron and Steel	7	
Rayon and Film	4½	
Petroleum	3	
Other	6½	
Non-Acid Uses:		
Pulp	7½	
Ground and refined	5	
Carbon bisulphide	4½	
Other chemicals and misc.	3	
	100%	

cess mines has increased from seven to 13 and the number of undertakings to obtain sulphur from other sources has greatly multiplied.

Two of the six new mines have been mentioned previously. The other four are Starks, opened by Jefferson Lake in mid-1951; Spindletop, completed by Texas Gulf in mid-1952; Bay Ste. Elaine of Freeport, in late 1952; and Damon of Standard Sulphur Co., in late 1953. In addition, Texas Gulf

expanded the capacity of its Moss Bluff mine. These Frasch projects, although outnumbered by the wide variety of projects to obtain sulphur from other sources, have contributed by far the greatest amount of new productive capacity.

Of the other projects, the most striking gain has been in the recovery of sulphur from sour natural gas and refinery gases. Stimulated by the mounting demand for natural gas coupled with the drive to reduce atmospheric pollution, this trend had already become evident before the Korean war. The amount of sulphur recovered from these gases has gone from 57,000 tons in 1949 to an estimated 350,000 tons in 1954. At the same time the number of such recovery plants has increased from four to more than 30.

The sulphur expansion program could be said to have brought a "new era" in sulphur. Not many years ago the nation's sulphur mines could be counted on the fingers of one hand. These mines—principally Boling and Grande Ecaille—were able to keep U. S. industry and agriculture plentifully supplied and to meet the needs of foreign consumers. Now, although Boling and Grande Ecaille are still the largest producers, an increasing proportion of the nation's supply is coming from the newer and relatively small mines.

These new operations generally are much less favorable than the big successful properties developed in years past. The deposits are leaner and



Insulated barges to transport molten sulphur to storage solved one of the problems met at marshland mines



Garden Island Bay mine of Freeport Sulphur Co. produced more than 500,000 long tons

less accessible, the construction and operating costs higher, the risks greater. Finding and developing sulphur has become, and will continue to be, a very much harder job than formerly.

Marsh Mines Typify New Era

Freeport's new marshland mines illustrate some of the aspects of this new era. Garden Island Bay, for example, is 18 miles—by water—from the nearest road, and is accessible

only by boat or plane. All the facilities, including the mining plant capable of producing several million gallons of superheated water a day, had to be built on a forest of piling. Special precautions had to be taken to protect the site from hurricane winds and high water which are not uncommon in the Gulf region.

Even more difficult problems were faced at Bay Ste. Elaine, another new marshland mine. The small size of the deposit and the fact that the mining area is almost wholly submerged

made the cost of permanent facilities prohibitive and led to the design of an all-marine mining plant. This "floating" plant was towed 65 miles to the site and partially sunk in place on a prepared shell bottom.

Another problem encountered at these mines was the lack of solid ground on which to store the sulphur. Insulated barges transport the sulphur in molten form in which it is mined to Port Sulphur, the storage and shipping point on the Mississippi. This operation requires a fleet of seven barges plus four radar-equipped towboats. Added to this fleet are more than 100 marine units ranging from work boats and a cabin cruiser to expensive drilling rigs.

Outlook for 1955

Although nearly all of the projects that were undertaken in this long-range expansion program have been completed, some efforts to add further to productive capacity are still in progress. Among these endeavors are a Frasch process mine at Chacahoula dome, to be put into operation by Freeport early in 1955, as well as several projects to recover sulphur from sour natural gas and refinery gases.

With productive capacity already at an all-time high and with these further gains in prospect, the U. S. sulphur industry begins the new year in a strong position to meet all the demands upon it. There should be ample sulphur to supply in full the needs of consumers both at home and abroad.

Bituminous Coal

(Continued from page 51)

Development, United States Atomic Energy Commission, said in part: "One continuing source of misunderstanding regarding the prospects for economic nuclear power lies in the fact that the qualifications and reservations usually accompanying predictions regarding the time scale for achieving economic nuclear power are frequently disregarded. In most cases, this 'fine print' is important even though it may not be as newsworthy as the estimates themselves . . ."

Davis summed it up in this way: "I have every confidence that the scientists and engineers will successfully solve the problems involved in the economic use of nuclear power. However, it is clearly not a short-range or easy accomplishment."

Dr. Robert E. Wilson, Chairman of the Board, Standard Oil Co. (Indiana), in discussing market potentials in atomic energy and related industries, said in part: "No important phase of the oil industry will be adversely affected by atomic energy in the foreseeable future. If anything,

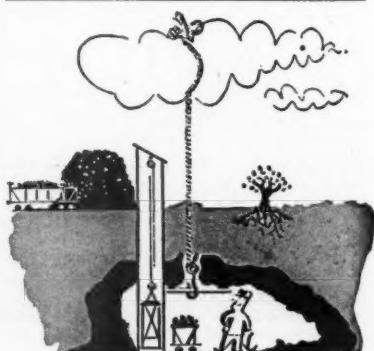
the oil industry will benefit from atomic energy. . . At the risk of seeming facetious, I will say that at the end of 20-25 years, we might turn around long enough to say 'Was that a mosquito that bit us?' and then go on trying to handle our growing business."

Dr. Wilson said that most experts will agree that: (1) Few if any atomic power plants will be built for purely commercial purposes in this country within ten years. The few would be only at points remote from conventional supplies; and (2) between 10 and 25 years from now—depending on technological developments and prices of competitive fuels—moderate proportion of the larger new power plants might be built to use atomic fuel. But no efficient existing plant would be shut down or converted to atomic fuel.

In conclusion, Wilson said: "In view of our rapidly growing need for power, the long-range problem is not what fuel is going to be crowded out but what can come along to help carry the rapidly growing load." He said that barring a world cataclysm the world's power requirements would probably increase tenfold within the next century.

A Long Range Look

In consideration of all of these known and estimated factors regarding energy supply, our thoughtful expectation is that from the low point of production recorded by bituminous coal in the United States in 1954, a modest but gradual increase in annual coal tonnage is to be expected for the next five years; after that the growth should be a little more rapid to approach an annual three-quarters of a billion tons a year in the period from 1970 to 1975.





Indications are that purchases of lead and zinc for the national stockpile have not accomplished their primary purpose

Lead and Zinc

**After Drop in Consumption in 1954, Outlook for 1955
Indicates Rise in Use With Adequate Supply and
Relatively Stable Market**

By CHARLES R. INCE

Vice-President & Sales Manager
St. Joseph Lead Co.

IN 1954 the drop in lead and zinc consumption, which averaged 10 percent below the previous year's level, was not too bad considering the high rate of use established in 1953. The decline was about in line with the reduction in the Industrial Production Index, and consumption of lead at around 1,100,000 tons and zinc at 860,000 tons might be considered good by normal standards. Unfortunately imports continued at a high rate and while they also declined somewhat from the previous year's figure were still in excess of requirements and continued the unbalance which existed the year before resulting in a depression of the lead price to 12.5 cents a lb and zinc to 9.25 cents early in the year. With the resumption of Government stockpiling at mid-year the threat of surplus of both metals was removed and lead advanced to 15 cents per lb while zinc rose to 11.5 cents the year-end levels.

Of the two metals lead appears to have been the strongest statistically throughout the year as can be seen in the table on supply and consumption of both metals.

Nevertheless both metals were confronted with a surplus throughout the year and Government stockpiling was responsible for what improvement developed in the market. It will be recalled that late in 1953 the United States Tariff Commission held hearings on the lead and zinc tariff rates on the recommendation of Congress and as a result of an appeal under the Escape Clause of the Reciprocal Trade Agreements Act by the lead and zinc industries. Its report to the President made on May 21, 1954, recommended that the full tariff increases permissible by law be granted. However, the President refused the increase on the recommendation of the State Department, and proposed stockpiling as an alternative aid to

the domestic mining industry "to maintain an adequate mobilization base." The President promised however, that if stockpiling did not prove adequate, other means of helping the domestic industry would be reviewed. Purchases by the Government started at mid-year. It is too early to say whether the program is accomplishing its purpose. Indications are that it is not. Domestic mine production of both metals has shown little if any improvement while imports continue at a rate well in excess of requirements. However, by absorbing more than the monthly surplus in zinc and a major part of the over-supply of lead, Government stockpiling was responsible for increasing domestic prices to the year-end levels of 11.5 cents for zinc and 15 cents for lead, and to this extent U. S. mines are benefiting on the metal they turn out.

Despite the increases of 11 percent for lead and 15 percent for zinc this past year, the price of lead at 15 cents is only 86 percent of the Commodity Index and zinc 87 percent, whereas copper and aluminum are 131 percent and 127 percent, respectively. Thus, the metals are competitive pricewise with other commodities and could even appear to stand some further improvement without hurting their position. A redeeming feature of both metals has been the improved demand abroad. Zinc consumption outside of the Western Hemisphere increased 30 percent over the previous year compared with a decline of 13 percent in the U. S. A. and 9 percent in Canada. Similarly, there has been a marked improvement in lead buying abroad, as evidenced by the rise in the London Metal Exchange price from a low of £80 to a year-end figure of £106 per metric ton, an increase of about three cents per pound, and typified by a 10 percent increase in the United Kingdom consumption.

With improved demand abroad the future of the lead and zinc markets in this country would appear to rest on the prospective requirements. The Federal Reserve Board predicts a five percent rise in industrial production this year and since lead generally follows this index, we can expect a comparable improvement in the consumption of lead to around 1,150,000 tons. Such an increase in consumption should go far to offset the surplus which existed last year but still would require stockpiling to eliminate the threat of an over-supply. In general, it would appear that the lead situation should be closely in balance throughout most of the year with consumption up, supplies adequate and a relatively stable market.

Zinc consumption during the coming year should stage a greater recovery than lead. This metal tends to

COMPARISON OF DOMESTIC LEAD & ZINC SITUATION—1953-1954

	Lead 1954 (Tons)	Percent Change		Zinc 1954 (Tons)	Percent Change
<i>Consumption</i>	1,095,000	—9.0		860,000	—12.8
<i>Supply</i>					
Mine Production	314,000	.....	U. S. Primary & Secondary Prod.	868,000	
Imports (net)*	460,000	.....	Metal Imports (net)*	136,000	
Secondary Production*	408,000	.....		
	1,182,000	—10.0		1,004,000	—15.0
<i>Surplus</i>	87,000	.....		144,000	
<i>Consumption by Industries*</i>					
Tetra-ethyl lead	164,000	+8	Galvanizing	400,000	—1.7
Storage Batteries	334,000	—9.0	Die casting and zinc-base alloys	275,000	—10.4
Cable Covering	126,000	—13.7	Brass Products	102,000	—42.7
Construction	101,000	—6.4	Rolled Zinc	46,000	—16.4
Pigments	119,000	—8.5	Oxide Plants and other	37,000	—5.4
Solder	70,000	—11.3			
Ammunition	39,000	—14.8			
All other uses	142,000	—13.4			
<i>Total</i>	1,095,000	—9.0		860,000	—12.8

* November-December—estimated.

follow activity in the steel and automotive industries rather than the general industrial index, which is quite natural since these two industries account for, or are actively associated with, 75 percent of zinc usage. Estimates of automotive production for 1955 indicate an increase of 10 percent over 1954 (5,400,000 to 5,800,000

or 6,000,000 units) and for steel 12 to 14 percent (71 percent of capacity in 1954 versus 80 percent for 1955). On this basis, we might expect a rise in zinc consumption of at least 10 percent to about 945,000 tons. This increase in consumption of 86,000 tons would substantially reduce the 1954 surplus and, coupled with Government

stockpiling which evidently will continue at even higher than the present price, should result in a substantial improvement over the 10.68 cents average of 1954. Thus, the prospect for the zinc industry appears to be one of increased consumption, adequate supplies and a firm market at current or higher levels.

Chromite

Domestic Output Increased But Prudence Dictates Government Stockpiling Program Should Be Continued Beyond Expiration Date

By F. W. LIBBEY

Mining Engineer, Formerly Director, Oregon Department of Geology and Mineral Resources

CHROMITE production in the United States increased substantially during 1954 because of the government purchase program. Total output was approximately 165,560* short tons valued at about \$7,278,000. The greatest increase was in Montana where, at its Mouat mine, the American Chrome Co. produced 123,000 short tons of concentrates valued at about \$4,000,000 and containing more than 38 percent Cr₂O₃ with a chrome-iron ratio of about 1.5 to 1. The company has a government contract to supply 900,000 tons of concentrates by December 31, 1961. Production at Mouat started in August 1953.

* Bureau of Mines statistics are computed in short tons. Government program is in long tons and so published in Federal Register.

Chromite, both as lump ore and concentrates, produced in California and Oregon has been shipped to the Grants Pass, Ore., purchase depot established by the government in 1951. According to government specifications the material purchased must be 42 percent Cr₂O₃ or better and have a chrome-iron ratio of 2 to 1 or better. During 1954 California produced an estimated 28,800 short tons valued at \$2,347,000. This was an increase of approximately 13 percent compared to 1953. A preliminary estimate by the U. S. Bureau of Mines credits Oregon with approximately 10,000 short tons produced during the year valued at nearly \$785,000. This figure represents an increase of more than 66 percent compared to 1953. At Coquille, Coos County, Ore., Pa-

cific Northwest Alloys, Inc., started to upgrade stockpiled chromite sand concentrates produced during World War II. The upgraded material will be treated in the company's plant at Meade, Wash., to make low-carbon ferrochrome. Reportedly Mineral Sands Co. of Lansing, Mich., will build and operate a plant for treating chromite sands on coastal land leased from Coos County.

Alaska chrome production amounted to 3360 long tons valued at \$146,000 produced from Kenai Chrome Co. mine, Kenai, Alaska.

Total amount of chrome produced under the government chromite purchase program at Grants Pass amounted to about 38,800 short tons. This brings the cumulative total, since the beginning of the program, to approximately 94,800 short tons or 84,644 long tons (final figures have not been officially released). Since the total amount to be bought under this program is 200,000 long tons, the program was 42 percent complete at the end of 1954 and has 2½ years more to run.

Domestic producers cannot compete with foreign chrome in the world markets and now when an all-out war might hit this country overnight and imports cut off, it would appear that even elementary prudence would dictate that the domestic chrome mining program be continued and expanded.



Lack of adequate protection was reason for low rate of domestic mine production

Antimony in 1954

Low Cost Imports Supply More Than 90 Percent of Domestic Consumption

By JAMES P. BRADLEY

Vice-President
Bradley Mining Co.

DURING 1954, domestic mine production of antimony (principally the by-product output of the Sunshine Mining Co., Kellogg, Idaho) was less than seven percent of U. S. primary antimony consumption. The former leading domestic antimony producer—Bradley Mining Co.'s Yellow Pine Mine and Smelter at Stibnite, Idaho—has been inactive since mid-1952, except for exploration work which continues on company account and under contract with the Defense Minerals Exploration Administration.

The low rate of domestic antimony mine production can be attributed to the competition of low-cost foreign imports with practically no tariff protection. There is no duty on antimony ores and concentrates, which comprise the bulk of antimony imports, and the tariff rates on antimony metal and oxide are only two cents and one cent per lb., respectively.

Supply-demand statistics are not yet available for the full year 1954, however, the data for 1953 and the first nine months of 1954 are summarized as shown in Table I.

Of the total imports of 7117 tons received during the first nine months of 1954, 2081 tons (29 percent) came from Mexico, 1844 tons (26 percent) from Bolivia, 994 tons (14 percent) from the United Kingdom, 820 tons (12 percent) from Belgian-Luxembourg, 472 tons (seven percent) from Peru, 435 tons (six percent) from Yugoslavia, and the balance (471 tons

or six percent) from Chile, France, Netherlands, Union of South Africa and West Germany.

Antimony prices strengthened during 1954, as shown in Table II.

Research on the antimony intermetallic semiconductor compounds expanded during 1954, under both industrial and governmental sponsorship.

The results of investigations to date indicate large potential markets for the aluminum-antimony and indium-antimony compounds in new types of rectifiers and other electronic devices.

In September 1954, the Office of Defense Mobilization announced that antimony was one of the five commodities (the others being chromite, lead, manganese and zinc) to be purchased on the open market from domestic sources for the long term stockpile and also that antimony was on the suggested list of commodities to be purchased from foreign sources—with foreign currencies that may be acquired from the sales of surplus agricultural products—for the supplemental stockpile. According to industry estimates, our nation's strategic stockpile of antimony is dangerously inadequate and it is hoped that these new stockpiling plans will ultimately bring the antimony stockpile up to a more realistic and safe level.

TABLE I—U. S. PRIMARY ANTIMONY STATISTICS*
(Short tons contained antimony)

	1953	1st 9 mos. 1954
Imports:		
Ore	7,778	3,905
Metal	2,627	2,252
Oxide	1,076	938
Sulfide	11	22
Total Imports	11,492	7,117
U. S. Mine Production	370	580
Consumption	14,300	8,640
Industrial Stocks, End of Period	6,900	7,500

* From U. S. Bureau of Mines.

TABLE II

Foreign Antimony Metal	Antimony Oxide	Delivered (per pound)	Antimony Ore, New York (per short ton unit)
Duty Paid, New York (per pound)			50-55% 55-60% 60-65%
First of 1954 25c-26.5c	26c	\$2.55-\$2.65	\$2.80-\$3.00
End of 1954 26c-28.5c	29c	\$2.80-\$3.00	\$3.00-\$3.20
			\$4.00-\$4.20



Increased emphasis is being placed on tailoring coal to the consumer's demand—the cleaning plant plays a most important part in this step

Coal Preparation in 1954

Emphasis Is on Heavy Media and Cyclones for Coal Cleaning and Dewatering Both Here and Abroad

By JOHN GRIFFEN

Coal and Coke Consultant
Pittsburgh, Pa.

NEW installations and the development of new ideas in coal preparation during 1954 followed very closely the pattern of 1953 but on a somewhat reduced scale because of the reduced rate of coal production and the less favorable economic situation of the industry. In 1954, the emphasis was on the use of heavy media for the cleaning of coarse coal, fine coal cleaning by wet tables and interest in cyclones for water clarification.

Coarse Coal Cleaning

During the year the capacity of heavy medium units installed for cleaning coarse coal considerably exceeded the combined capacity of jigs installed for that purpose. The former also increased the top size of the coal handled well beyond that handled by jigs which seems to be limited to about eight in. Two Tromp plants handling quite large coal went into operation during the year. At Blue Diamond, a unit is cleaning 14 by 2-in. coal, while 2 by $\frac{1}{4}$ -in. coal is cleaned in a second unit. At Ethel-Chilton, 12 by 3/16-in. coal is cleaned in one unit. With properties having a market for lump and large egg, this development opens the way to the

elimination of expensive hand-picking and insures the production of a uniformly high-quality coal. Cleaning results with heavy medium units have proven to be much more consistent than those of hand-picking and the heavy medium units are better able to handle wide fluctuations in the refuse content of the raw coal.

Fine Coal Cleaning

Wet methods of cleaning fine coal continue to predominate and the use of wet concentrating tables continue to grow in their proportion of total installations.

A novel and interesting method of conditioning the feed to wet tables which eliminates large settling tanks or similar devices was developed at the Jamison No. 9 property in northern West Virginia. The minus $\frac{1}{4}$ -in. coal and water from the jig classifying screen are pumped directly to a battery of large low-pressure cyclones, designed by Jamison Coal and Coke Co. Six 20-in. cyclones in parallel receive approximately 3000 gpm, delivered with about eight psi pressure. The cyclone overflows are joined to a common header which is fitted with a back-pressure valve. Adjustment of

this valve permits control of the dilution of the table feed to an optimum value. The overflow of the cyclones carries about eight percent solids, substantially minus 100 mesh, and the plus 325-mesh solids are below four percent ash. A typical analysis of overflow solids is shown in Table I.

TABLE I

Size	% Weight	% Ash
On 50 Mesh.....	Trace	
50 to 100 Mesh.....	1.9	3.0
100 to 200 Mesh.....	15.4	3.0
200 to 325 Mesh.....	13.5	3.7
325 Mesh to 0.....	69.2	17.9
Total	100.0%	13.4%

This use of cyclones materially reduces the equipment cost and building space required. Maintenance on pump and cyclones will probably be less than that on the settling tank and elevator. With such a low pressure drop across the cyclones the extra power due to pumping should be reasonable.

An additional interesting feature in connection with this cyclone installation is the use of riffle screens to recover the coarser solids from the overflow of the cyclones. The riffle screen overflow ultimately reaches the Peterson filters for final dewatering. A portion of the riffle screen underflow is ultimately delivered to the thickener where it is completely clarified and returned to the plant water circuit. This is probably the first use in a bituminous preparation plant of the riffle screen, widely used in anthracite plants.

Dewatering and Drying

Increased use of mechanical loading and continuous miners has decreased the average size of fine slack. This has increased the moisture content of washed fine slack and has concentrated attention on the development of means for dewatering that will eliminate the degradation occurring with existing dewatering equipment, particularly the various centrifugal machines and heat dryers utilizing high velocity gases, which often cause an increase of 100 percent in the extreme fines.

At the Ernest property of the Rochester and Pittsburgh Coal Co. a pilot plant, put into operation in December 1953, has proven that degradation can be reduced materially. This plant is handling $\frac{1}{2}$ -in. by 0 coal which is washed on wet tables. The clean coal is collected in a settling boot, and delivered by a dewatering elevator to an Oliver horizontal filter. Overflow from the boot is sent to cyclones and their underflow delivered to the filter, being distributed over the bed of minus $\frac{1}{2}$ -in. coal. The filtered coal is then dried in a Pulso screen type dryer which handles the coal gently producing little degradation.

The filter coal shows 13 to 14 percent total moisture, which is perhaps one or two percent more than obtainable with other equipment; however, the Pulso dryer produces a product with 3½ percent, or less as desired.

Degradation during filtering is less than seven percent of the plus 48-mesh coal and the increase in minus 200-mesh size is less than 30 percent of its initial quantity. Both of these are comparatively small amounts. Degradation through the Pulso dryer is even less, being less than 2 percent of the plus 28 mesh. The increase in minus 200-mesh size is less than 10 percent of its initial quantity.

European Developments

Papers presented before the Second International Coal Preparation Congress in Essen, Germany during September 1953 indicated the trends in Western Europe. The use of the various heavy medium processes, both those developed in Europe and those imported from this country, continues to grow and every effort is being made to extend them to the treatment of the smaller sizes of coal.

In Belgium a Wemco heavy medium cone, using magnetite as the medium, is successfully cleaning a 6 by 1-mm ($\frac{1}{4}$ by $\frac{1}{25}$ -in.) raw coal. The Dutch States Mines have been experimenting with a modification of the cyclone heavy medium washer for the cleaning of fine coal which offers improvements in reducing mill head and maintenance costs. This improvement consists of operating with a much lower pressure drop across the cyclone and placing the cyclone in a horizontal



A horizontal filter in use at the Ernest mine of the Rochester and Pittsburgh Coal Co.

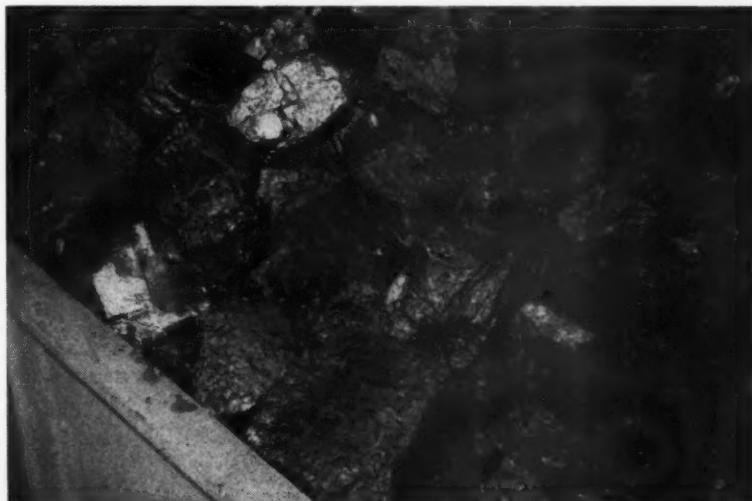
rather than a vertical position. A head of only four meters (13 ft) suffices, diminishing the wear and power consumption and simplifying plant layout. At the same time the magnetite medium recovery equipment has been considerably reduced.

Similar experimental work on low pressure cyclones has been carried out in Germany with quite satisfactory results. Here the cyclone axis is inclined at 15° above the horizontal.

In connection with water clarification the French have been experimenting in their research laboratory with low pressure cyclones where the heads are from three to five meters (13 to 17 ft) and have found them to have interesting possibilities for handling large volumes of circulating water by gravity and recovering the coarser solids in a small volume of pulp convenient for further processing. This work somewhat parallels the actual installation of low pres-

sure 20-in. cyclones at the Jamison No. 9 plant mentioned above. This is only one of a number of possible applications for such units in a washery circuit.

For the prevention of stream pollution the British National Coal Board has made several installations of pressure filters to recover the tailings from froth flotation plants which have been previously flocculated and thickened to 30 percent solids or more. Feed is pumped to the filter at high pressure and a cake, about two-in. thick, is produced which can be satisfactorily handled by a belt conveyor and delivered to the refuse dump with the balance of the washery refuse. Cake moisture, under favorable conditions, is as low as 20 percent and the filtrate is crystal clear. Operating costs are rather high but may be justified under conditions where stream pollution regulations are stringent and rigorously enforced.



One coal company is cleaning up to 14-in. coal with heavy medium, eliminating hand-picking entirely



International Minerals & Chemical Corp., Bonnie Chemical Plant came into production. Uranium is an important by-product

Phosphate and Potash

New Production Records Set With Prospects Bright for Future of Both Minerals

By G. T. HARLEY

Geological Engineer
Engineer of Mines
Carlsbad, N. M.

Phosphate

FIGURES are not available as yet for the 1954 production of phosphate, although on the basis of statistics for the first half of the year, world production may reach a record high of 27,000,000 long tons with U. S. mining producing slightly less than half of this total, or about 13,000,000 tons. U. S. production may have increased nearly 500,000 tons over the 1953 figures which means that the remaining world increase of 1,600,000 tons originated in the mines of North Africa, U. S. S. R., Egypt and other minor sources.

Florida at Capacity

During 1954 the Florida phosphate mines operated at about capacity and final figures should show a production of slightly under 10,000,000 tons which would constitute a record. The entire production with a very small exception consisted of Florida Land Pebble Phosphate. Sales and shipments may have lagged a little behind

production, indicating a small increase in stockpiles.

Several technical developments are to be recorded in this field:

The American Agricultural Chemical Co. installed a new 650-B dragline and increased the capacity of their washer, recovery and drying facilities. This company is reported also to have purchased a large acreage of phosphate bearing land.

Armour Fertilizer Works is erecting a Bucyrus-Erie 770-B dragline and will shortly open a new mine to be served by this unit.

Davison Chemical Co., near Bartow, has started the operation of its new triple superphosphate plant having an annual capacity of 200,000 tons. At Bonny Lake a conveyor belt 1200 ft long will be used to remove overburden. This belt will be fed by lateral conveyors each consisting of one or two 100-ft sections, with each lateral being fed from a 20-ft square hopper equipped with mechanical

feeders. Each hopper will be fed by a Bucyrus-Erie 54-B dragline having a 70-ft boom and a 3½-cu yd bucket.

International Minerals and Chemical Corp. has installed the largest dragline in the field, a Bucyrus-Erie No. 1250-B. It is equipped with a 235-ft boom and a 26-cu yd bucket. The cab on a 650-B dragline was redesigned to increase production and insure operator comfort in a campaign to "fit the machine to the man." New classifiers and storage bins were built at Peace Valley and automatic controls installed on feed and clear water pumps. At the Achan mine the washer capacity was increased by some 25 percent. The new Bonnie chemical plant, near Bartow, came into production during the year after a heavy start up expense, producing principally a grade of phosphate suitable for mineral feed. Later in the year an addition was made to the plant useful for the production of triple superphosphate at the rate of 200,000 tons per year. A by-product of the Bonnie plant is uranium.

Swift & Co. has installed improved type hydraulic mining guns to increase production and decrease manpower. There has also been an effort made to neutralize any waste waters which may find their way into public waters.

Virginia-Carolina Chemical Corp., at Nichols, successfully started the operation of new handling, wet storage, drying and grinding units. This company has a double-wing stacker for storage of various grades of wet phosphate rock which is different from any other stacker in the field. Reclamation of the products is by conveyors located in underground tunnels under the parallel rows of

stacked material. A five-mile pipeline for matrix handling has been successfully used and may well increase the operating flexibility of other units in the field. A new concentrated superphosphate plant was put in operation at Nichols, in which there is a uranium extraction by-product unit. Other plants in the area are reported to have produced steadily during the year, but without major changes in operating conditions or capital outlay. These include American Cyanamid Co. and the Coronet Phosphate Co.

Tennessee Production Up

Production of phosphate in Tennessee in 1954 has probably not greatly exceeded that of 1953, but may reach 1,600,000 tons in spite of the fact that lack of power due to low water level temporarily plagued the industry in the state.

M. C. Boyle Phosphate Co. completed a drying and grinding plant, and then proceeded to construct a washing plant near Anderson Bend.

Owens Phosphate Co. which operates a small drying and grinding plant, also built a small washing plant near Centerville.

The Mine Equipment Co. completed a crushing, screening and scrubbing plant, the product from which is hauled by truck to its plant site on Rutherford Creek.

The Tennessee Valley Authority continued phosphate operations in 1954 with mining being carried on at two localities. Two fused tricalcium phosphate furnaces at Columbia were reported to have operated for half the year, but the washing plant in that locality was idle. The tri-



The double wing stacker of Virginia-Carolina Chemical Corp. at Nichols, Fla., stores different grades of wet phosphate rock

calcium phosphate furnaces, one with a graphite hearth, the other with a copper hearth, were reported successful in resisting corrosion from the molten charge and the furnace gases, thus concluding the technical development of the fused tricalcium phosphate process. These facilities at Columbia are now for sale.

At Wilson Dam, Ala., a unit to briquette Tennessee matrix and Florida pebble was installed. The briquettes are calcined for use as charge to the electric phosphorus furnaces. Slag from the electric furnaces is expanded to make light aggregate. Calcium metaphosphate production has been increased by improvements in equipment and operation, and pilot plant studies are said to continue on the making of phosphate fertilizers from various types of raw materials,

and on methods for producing high analysis granular fertilizers.

Western Companies Active

There has been considerable development in the mining of phosphate in the states of Wyoming, Montana, Utah and Idaho, and production from this region may reach nearly 1,000,000 long tons for 1954, with continued growth expected for the future. Production of phosphate is reported to be over 60 percent electric furnace charge with the balance being converted to single and triple superphosphate for direct application on the soil. About 300,000 tons are exported annually into Canada. Most of the lower grade phosphate is mined by surface methods for use in furnaces, while the higher grade fertilizer material comes largely from underground operations. There was very little to note in the way of technical developments in this area, as conventional mining methods, both open pit and underground are the rule, and the treatment plants have been in operation for some time, with modification and replacement of equipment, and some plant expansion.

Anaconda Copper Mining Co. mines its ore at Conda, north of Soda Springs, Idaho, and ships to Anaconda, Mont., where it is converted into triple superphosphate.

Monsanto Chemical Co. installed a second electric furnace at Soda Springs, and mine their own ore in an open pit 16 miles north of Soda Springs.

Montana Phosphate Products Co., a subsidiary of Consolidated Mining & Smelting Co., Trail, B. C., continues to ship its entire output to Trail.

San Francisco Chemical Co. is shipping ore to Stauffer Chemical Co. superphosphate plants in California and Washington, and to the new triple superphosphate plant of Western Phosphates, Inc. at Garfield, Utah. This ore comes from their main op-



International Minerals & Chemical Corp. redesigned cab on 650-B to increase phosphate output and insure operator comfort

eration near Sage Junction, in southwestern Wyoming. In addition, some production is coming from Idaho and Utah, and considerable development work is being done in these two states.

J. R. Simplot Co. operates the open pit Gay Mine on the Fort Hall Indian Reservation in Idaho, and they also have surface mining operations near Randolph in northern Utah. Large quantities of low grade shale were supplied to the four electric furnaces of Westvaco Chemical Div. of Food Machinery and Chemical Corporation

at Pocatello, Idaho. Higher grade material from Simplot operations is utilized in their own triple superphosphate plant at Pocatello. The Simplot Company is the largest operator in the western area, and to maintain their leading position, they have acquired additional holdings near the Idaho-Montana line and have been doing development on this property.

Victor Chemical Works operates two furnaces at Silver Bow, Mont., and mine their own ore by underground methods some 30 miles south of the plant.

Corp. has introduced a 1PM continuous miner underground which is also demonstrating its superiority over the 4JCM type for potash mining. A new warehouse for the storage of finished products is in use, and a plant to utilize heretofore waste magnesium chloride liquors has been put in operation to convert this material to hydrochloric acid and various high quality grades of magnesium oxide.

Bonneville, Ltd., at Wendover, Utah, apparently produced potash during the year at about the usual rate, but with no known major changes in plant operation other than ordinary repairs and replacements.

Duval Sulphur & Potash Co. continued its program of dieselization of mine equipment with the purchase of a roof bolting machine and a rubber tired grader, both of which are powered by diesel engines. Diesel powered shuttle cars which have proven to be highly flexible in operation, are continuing to perform satisfactorily. Blasthole drilling is done exclusively with multiple mounted drill units. Belt conveyors which have been extended in conformity with the development and production program requirements are providing economical ore transportation in this track-free mine. Portable crushers are used in the mine to reduce the size of material feeding onto the belts. On the surface a granular plant has been added to the refining unit to satisfy customer demand for sized product, and a second storage warehouse is in use for the finished product.

Southwest Potash Corp. apparently operated during the year without major changes to its plant, except to construct a second storage warehouse.

Two new companies have announced their intention to start operations in

(Continued on page 81)

Potash Hits New High

FINAL figures for the production of refined potash products in the United States will in all probability exceed 3,000,000 tons for 1954, the highest production on record. This production comes from seven major companies, five of which are located in the Permian Basin of southeast New Mexico, one in California and the seventh at Wendover, Utah. Imports were received during the year from Europe at Atlantic coast ports in the United States and Canada, at prices lower than the delivered cost of domestic potash produced at Carlsbad. The U. S. Treasury Department referred the matter to the U. S. Tariff Commission for a hearing in January 1955, at which dumping practices were proven and the Tariff Commission now has the matter under advisement.

Deliveries of potash were made to 45 states, the District of Columbia, Puerto Rico, Cuba, Hawaii, Canada and a few other places. For the first time since 1940, a buyer's market developed during the year and a summer period of easy deliveries again appeared which made it necessary for the companies to provide additional storage space to take care of excess production during the slack months.

American Potash & Chemical Corp. at Trona, Calif., continued to extract potash from the brines of Searles Lake at about the usual rate. No major changes were reported in the method of processing the salt and only the usual replacements of worn and corroded parts, with desirable modifications were made. The Sharples centrifuge was introduced into the circuit in place of the formerly used suspended basket type centrifuge.

United States Potash Co. completed its No. 3 shaft several miles north of the original minesite, and a haulageway now connects this shaft with the No. 1 hoisting shaft. All of this work was completed at a cost reported to be considerably in excess of \$2,000,000. The larger type Joy continuous miner (1PM) is in operation and al-

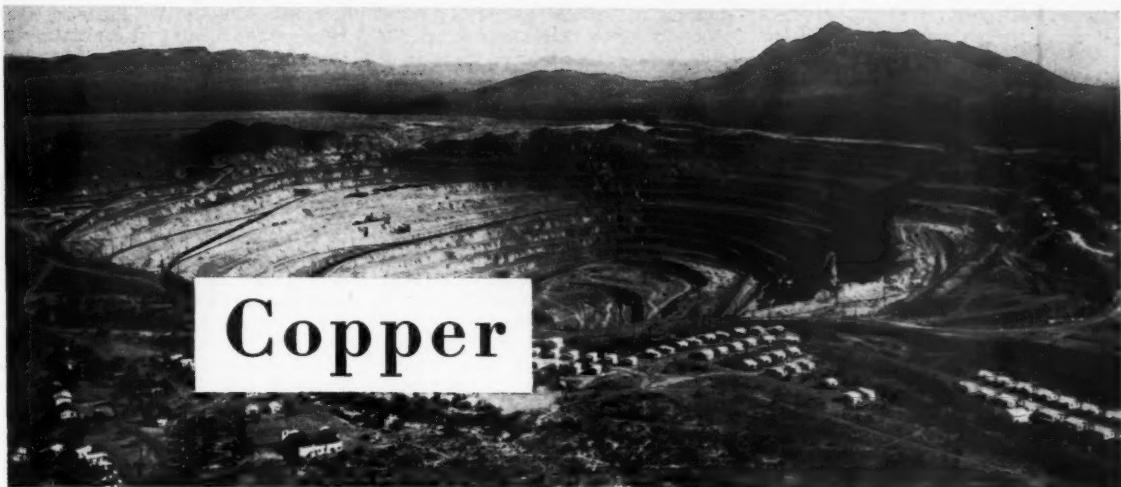
though still experimental, is demonstrating operating and tonnage advantages over those originally installed in the district. During the past year The United States Potash Co. resorted to temporary outside storage of finished products due to delays in the delivery of steel but later was able to start and nearly complete the construction of a permanent storage building over the storage area.

Potash Company of America during the past year contracted for equipment that will provide the nation's longest underground conveyor system, approximately 7½ miles in length. This compares with a 5½-mile conveyor system in a Pennsylvania coal mine, which is presently the longest. It is also reported that PCA has developed a new method for the flotation of potash salts as a result of extensive research.

International Minerals & Chemical



Potash Company of America contracted for nation's longest underground conveyor system. It will be about 7½ miles long



Copper

Domestic Output Down With Inventories at Year's End Lowest of Century. Future Consumption to Rise With Prices Following

By HELENA M. MEYER

Assistant Chief
Base Metals Branch
U. S. Bureau of Mines

AT THE outset of 1954 it appeared that mine output of copper in the United States would expand substantially above 1953, provided demand continued large, because several large new mines were scheduled to come into production during the year. Consumption did remain high for a year of peace but was about 20 percent less than in 1953, and production declined nearly 10 percent. The decreased output was the result not only of widespread labor strikes from August to October but also of lower production rates at large mines reduced shortly after the beginning of the year, when supplies appeared to exceed demand. The curtailment was effected substantially by cutting back the number of hours worked each week, and not by releasing miners.

Price confusion caused by the maintenance of Chilean prices at six cents above the United States level ended in December 1953, and in 1954 prices were not the dominant feature of the copper industry for the first time in three years. Strike-induced shortages in the third quarter of the year, as well as threats of strikes at Rhodesian mines, led to increases in prices on the London Metal Exchange to an all-time peak of £310 per long ton (equivalent to 38.75 cents per lb) in October, but

the policy of large producers in the United States was to maintain an unchanged price of 30 cents per lb for copper delivered in the United States. The United Kingdom Government broker discontinued selling copper on May 31, thus removing a prop that had helped to stabilize dealings on the London Metal Exchange since they were resumed August 5, 1953, after a lapse of 14 years.

The temporarily stringent supply situation in the United States, beginning in the third quarter, was solved in part by the action of the Office of Defense Mobilization, taken after strike settlements, in releasing to distressed consumers copper accumulated under the Defense Production Act and in diverting to such consumers copper scheduled for delivery to the Government in October to December, inclusive. Originally expected to be about 50,000 tons, later estimates of the quantities to be released and diverted were about 40,000 tons. At the request of the Canadian Department of Defense Production, ODM postponed scheduled delivery of 2600 tons of Canadian copper to aid distressed Canadian consumers.

The trend in consumption of refined copper in the United States was generally downward after reaching an

average monthly rate of 143,000 tons in April to June 1953 (following abandonment of allocation control in February). This downtrend continued through February 1954, and then except for July, the rate settled to a range of 105,000 to 110,000 tons a month. The small July consumption of 74,000, lowest for the year, was due to regular annual vacations at many copper-fabricating plants. For the year as a whole, consumption probably decreased 20 percent from an average monthly rate of 125,000 tons in 1953 to slightly over 100,000 tons in 1954.

In June the President signed a bill continuing for another year, from June 30, suspension of the excise tax (two cents per lb) on copper. In August he signed another bill extending suspension of duties on metal scrap, other than lead and zinc with certain exceptions, to June 30, 1955.

Because demand was dropping, two of the three major copper-producing companies announced production cuts in January and the third early in February. At the end of the latter month the largest producer announced further cuts which, however, were substantially rescinded in May. In no month in 1954 did mine production attain the monthly average of 77,000 tons reached in 1953; the outputs of 75,000 tons in January and 73,000 in June were the highest monthly totals in 1954, and the 52,000 tons in strike-ridden August was the smallest. Average for the year was about 69,000 tons or close to 10 percent below 1953. The chief work stoppages began at the Arizona, Nevada, New Mexico, and Utah properties of the Kennecott Copper Corp. in mid-August and spread a week later to the Arizona mines of the Miami Copper Co. and Inspiration Consolidated Copper Co., the Miami smelter of the International Smelting & Refining Co., and the Butte and Great Falls, Mont., properties of the

Anaconda Copper Mining Co. The Kennecott strikes were settled on September 1 and those at Miami, Inspiration and International on September 16. The Garfield, Utah, smelter of the American Smelting & Refining Co., which smelts the output of Kennecott's Utah mine, was closed by strike on September 13 and the Kennecott Garfield refinery September 14. Both strikes were settled October 13. The strike at the Butte and Great Falls plants of Anaconda was settled October 16.

New Mines Produced

On the other hand, four new large operations reached the production stage in 1954. The first three, all open pits and all in Arizona, were as follows: Silver Bell mine, Pima County, of American Smelting & Refining Co., started in April and was expected to produce 18,000 tons of copper annually; the Bisbee East (Lavender pit) mine, Cochise County, of the Phelps Dodge Corp., started in July and was expected to produce 38,000 tons annually; the Copper Cities, Gila County, owned by a subsidiary of the Miami Copper Co., started in August and was

Exports of refined copper averaged 18,000 to 19,000 tons a month in 1954 or double the 9100 tons in 1953.

Year-End Inventories Low

Industry stocks increased significantly in 1953 and were trending upward at the year end. After reaching the peak of their upward movement in March 1954, producers' inventories of refined copper dropped without interruption until October 31, when they held 21,000 tons, believed to be smaller than any year-end quantity in the twentieth century. Producers held 74,000 tons on March 30, 1954, and 49,000 on December 31, 1953. Fabricators, according to the United States Copper Association, held 331,000 tons of refined copper, metal in process of fabrication, and primary fabricated shapes on October 31 compared with 342,000 tons on March 30, 1954, and 381,000 tons on December 31, 1953. Producers' and fabricators' stocks at the end of 1954 probably approximated those on October 31.

New supplies of refined copper from primary and secondary sources were estimated at 1,610,000 tons in 1954, a decrease of 10 percent from 1953.

	Thousand Tons		
	1952	1953	1954 (Estimated)
Refined copper from primary, domestic and foreign materials	1,178	1,293	1,185
Imports, refined	347	275	220
Copper recovered from scrap in refined form	154	213	205
	1,679	1,781	1,610

expected to produce 22,500 tons annually. The fourth was the underground White Pine mine, Ontonagon County, Mich., owned by a subsidiary of the Copper Range Co., where the mill was started in October, and where 36,000 tons annual production is expected.

The "Greater Butte Project" of the Anaconda Copper Mining Co. at Butte, Mont., that began to produce in 1952, was to increase to 15,000 tpd of ore basis by the end of 1954. At that rate this project was to add 45,000 tons to the annual copper mine production capacity of Montana.

Still to come into production was the San Manuel, Piñal County, Ariz., mine, owned by a subsidiary of the Magma Copper Co. This underground mine, expected to produce 70,000 tons of copper annually beginning in 1957, might begin operating in 1956.

Imports Down, Exports Up

Based on rates for the first 10 months of the year, it appeared that imports of copper in crude and refined forms would average somewhat less than 50,000 tons monthly in 1954, of which less than 20,000 would be refined copper compared with 56,500 and 22,900 tons, respectively, in 1953.

General Services Administration announced the signing of contracts with the Anaconda Sales Co. and the Kennecott Sales Corp. for 64,000 and 36,000 tons, respectively, of Chilean copper for delivery to the National Stockpile.

World Output Nearly Level

It is estimated that world production dropped only about three percent in 1954 from the 3,030,000 short tons in 1953, as decreases in the United States and Chile were substantially offset by increases in Canada and Northern Rhodesia, as well as in some of the smaller copper producing countries. Northern Rhodesia outranked Chile as the second largest copper producing country for the second successive year.

Pattern of production in Chile was similar to that in the United States. Production at major mines was cut by curtailment of the workweek and strikes adversely affected the records for August and September.

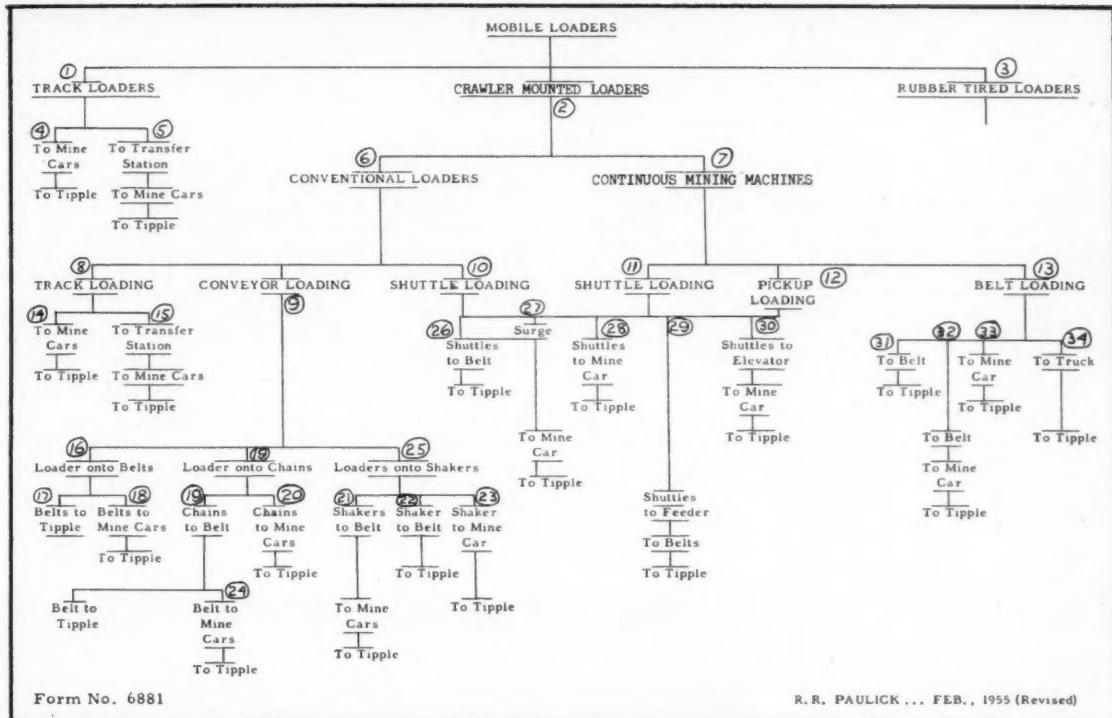
Strikes at several properties in Quebec, beginning in August and October 1953, were settled in February 1954.

There were continuing problems in connection with advancement for the natives in Northern Rhodesia and threats of serious work stoppages, but the several strikes that occurred there in 1954 were short lived. Despite the strikes and the continuing inadequate coal supply, output rose possibly more than five percent over the previous all-time record of 411,000 tons in 1953.

Exploitation of the Toquepala copper property of the American Smelting & Refining Co., Northern Peru, was brought nearer by the November announcement of the Export-Import Bank that it was prepared, in principle, to extend the company a credit not exceeding \$100,000,000 to assist in financing the venture costs.

Consumption to Rise

Consumption of copper probably will rise somewhat in 1955 if forecasts by a wide group of business specialists, Government officials, and others that there will be a high level of industrial activity are borne out, because copper is used so extensively by the electrical, construction, automobile, and some other basic industries. In these circumstances copper prices probably will be maintained, even if supplies are somewhat greater in relation to demand than in 1954. Population gains and improvements in living standards doubtless will cause an up-trending consumption of copper in the years ahead, although the rate of increase doubtless will fall substantially short of that for the century thus far. Prices, likewise, will probably follow an upward course, subject to the inflationary forces generally present in the economy from the beginning of industrial development until now.



Form No. 6881

R. R. PAULICK ... FEB., 1955 (Revised)

A chart showing various types of underground "Mobile Loading Systems" in use in the United States . . . with accompanying transportation service

Mechanical Coal Mining Progress

Intense Intra-industry Competition, plus that from Gas, Oil, and Better Fuel Utilization Dictate the Use of High Efficiency Mechanization Programs for Survival

IN this period of intense competition both within and from without the coal mining industry, it is imperative that all possible means and methods be utilized to produce coal economically. It is estimated that in 1954 the total bituminous tonnage amounted to roughly 392,000,000 tons. Of this total it is further estimated that 24 percent was produced by surface strip operations of all sizes, and 76 percent by various underground mining methods. Of the underground total about 82.5 percent tons was produced mechanically.

It is with this tonnage we are concerned in this article and with the ways and means of producing the total underground tonnage most economically.

Mobile Mining Methods

There have been innumerable articles and papers written and published and talks given on the various methods

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of mining coal mechanically at individual properties and operations. But each article or paper—and rightly so—described only the methods of producing coal at the mine or company under discussion.

It is proposed here to list and partially describe all the possible mechanical loading methods—confining the discussion to mobile loaders only—in use today in the U.S.A. This is done by means of a chart which lists and shows many possible ways of producing coal with mobile loaders, be they track, crawler, or rubber mounted, together with the accompanying transportation service.

As used here, mechanization means the actual handling or lifting of the coal from the mine floor or face, and

placing it on some form of conveyance—mine cars, shuttle cars, chain and belt conveyors—for transportation to surface. In the past this meant a 4-cycle operation, cutting, drilling, blasting and loading. However, with the advent of continuous mining equipment, the 4-cycle operation is disappearing as such, and in many cases only the actual loading and transportation operations now figure in the production cycle.

There are many very definite economic advantages to be gained by large scale mine mechanization and modernization programs—the main one being cheap coal. In the majority of mines, labor costs still account for more than 50 percent of total cost, in some mines it is 60 per cent or more. Hence, mechanization with increased labor productivity, is the way to reduce over-all costs. Other large more advanced industries have gone beyond this; automobile to automation; accounting to electronics, etc. Coal still

must be content with advanced mechanization—automation probably is still far in the future. It is believed that only through intense mechanization and continued research can the coal industry hope to reduce production costs to the point where it can truly compete with gas and oil on a price per Btu basis.

Many factors affect the development and determination of the type of mechanization program to be installed to produce cheap coal in any given seam or mine. A successful mine mechanization program is not just "dreamed up," but is the result of much concentrated thought, engineering study and thorough analysis of all the known pertinent factors. Mining plans for the development and extraction of coal must be made and accessory ventilation and roof control systems designed. Main line haulage—belt or cars—must be analyzed and developed to give adequate service to the producing units. The type and source of power must be determined. A good maintenance and repair program or system must be worked out and set up. Moreover, on the surface the size and type of coal preparation plant to properly size and clean the product, together with waste disposal, must be planned. After all these and many other details are fully evolved and developed, then the underground loading system is planned and selected.

Representative Systems

In the following paragraphs, a brief description is made of several of the Mobile Loading Systems illustrated on the chart. Figures in parenthesis identify the system shown on the chart.

(A)—Crawler Loader (2) Conventional Type (6) Transportation Chain Conveyor (9) This was one of the first systems developed to get away from direct mine car loading and to increase productivity. It was a step forward in loading practice in that the intermittent "car change" or "buggy change" time normally accounting for 20 to 35 percent of the day—depending upon the over-all efficiency of the mine operation—was greatly reduced and more time was spent on the loading phase of the cycle.

Recently two innovations in this system of loading were introduced and are working successfully. One is the use of a bridge conveyor designed to enhance loadability at the loaders, and to load more accurately onto the chain conveyor. Another device is the use of a belt with a similar bridge type conveyor. However, all these are basically classified herein as; crawler loader, loading onto chain conveyor, thence to belt or mine car for transportation to the surface.

(B)—Track Loaders (1) Loading direct into mine cars (4). This type of loading represents one of the oldest forms of mechanical loading. It began when mobile loaders first began to

replace hand loaders. Some of the first crawler loaders for years, when just developed, also loaded coal directly into mine cars. Millions of tons of coal have been loaded by this method in the U.S.A.

(C)—Crawler Loader (2) Conventional Type (6) into shuttle cars (10) thence to belt or mine cars to surface. This is an advance over the mine car methods of loading and is becoming more prevalent every day. The savings with this system over direct car loading system are many; for example, no track, rails, ties, spikes, etc. are needed in a producing section. Track laying and track recovery labor is eliminated entirely.

Tremendous tonnages have been loaded with this method of mining throughout the years. Moreover, the shuttle idea is being utilized more and more with continuous mining machines. There are today more than 4500 shuttle cars in operation in U.S. coal mines alone.

Basically, there are four distinct

methods of taking coal away from a continuous miner being used today. First, there is the miner loading directly into a shuttle car, second the miner loads in a surge car, thence to another shuttle car, third the miner drops the coal on the mine floor, as it dislodges it from the face, where it is picked up by a conventional crawler loader and put into shuttle cars, and fourth, the miner loads the coal directly onto an extensible belt conveyor, thence to another belt, or mine cars, for transportation to the tipple.

(D)—Continuous Mining Machines (7) Shuttle Cars (11) to Belt (26) and to tipple. This method is similar to the one used by conventional crawler loaders. With this type of mining the working section is reduced to a minimum, one to two places as a rule, compared to six or more with a conventional 4-cycle loading system. As yet there are not many of these units in operation—compared to conventional loaders—but the popularity of

(Continued on page 84)



The track-mounted loader discharging directly into mine cars was the first step in mechanized mining . . .



. . . Crawler-mounted loaders followed



The lightweight drill is fast becoming the most popular unit underground

Underground Metal Mining Progress

Trend Toward Greater Mechanization Coupled With Miner Training Programs and Better Personnel Relations Marked Year. Outlook Is for Even Greater Stress on These Practices

By PROF. STEFAN BOSHKOV

School of Mines
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THE post-war years have witnessed unprecedented expansion in the mineral industry of this country. The industry also is witnessing and taking an active part in numerous revolutionary changes in the art and science of mining. Trends which in the early days were watched with caution by most operators have gained momentum. Hesitancy, in many cases, has been dispelled and new methods and equipment are in full trial. Major changes at any particular place result from practical on-the-spot research, which by necessity is time consuming.

As in past years, major reports in

the mining literature deal with the art of drilling and, as a whole, summarize long-term experiences in drilling research.

Tungsten carbide drilling is gaining steadily. Multi-use steel bits are still in use, but probably at a decreasing rate. Single-use or throwaway bits appear to be losing ground, even though they still remain popular in some places. The total consumption of throwaways has decreased but a partial explanation for that is the trend for resharpening some of these bits for re-use. It may be safe to assume that drilling with tungsten

carbide bits will make further gains in the years to come, and that the application of steel bits will continue to decrease.

Of the two carbide drilling media, the detachable insert bit still holds its lead over the tipped steel. It has been reported that sales of integral steel are increasing at an accelerated pace and that trials with $\frac{3}{8}$ -in. hex drill rod and $1\frac{1}{2}$ -in. bits are proving successful. There is a definite trend to smaller diameter drill holes.

The use of alloy steels is increasing. New methods of fabricating steels, new machines and bits and new practices may call for a reexamination of many steels with analyses that have not been satisfactory before. This is the opinion of the metallurgical supervisor of a large drill steel manufacturer. Studies of rod life are complicated in practical use as often the potential life built into the rod by the manufacturer is lost through mishandling and abuse in the shop and underground.

Drilling Practices Vary

The light-weight airleg drill is well on its way to becoming the most popular drilling combination underground. Originally used only in hard-to-work places, its use has spread to development work and drifting. In some cases the airleg has replaced the diamond drill in exploration and sampling work. The expanding use of the airleg has been aided to a great de-

gree by the improved models offered by drill manufacturers. Better balance and convenient grouping of controls facilitate operation and gain better miner-acceptance.

Since the manufacturers have supplied the field with an immense variety of drilling tools and drilling conditions vary greatly, the average operator is constantly trying new combinations in his efforts to effect a lower cost.

The following examples of drilling practice, picked at random, summarize the complexity of the problems and the efforts exerted in solving them.

Recent drilling tests at Calumet and Hecla exemplify trends set by other companies. After a series of inconclusive tests over a period of several years, lightweight air-leg drills finally proved superior to and replaced post-mounted 3½-in. drifters in stoping work. Results given in 1954 show a 30 percent average increase in footage with smaller drill holes, an attendant reduction of 20 percent in powder cost, and 50 percent reduction in air consumption. The study also revealed that miner training is a vital factor in the introduction of new equipment.

The American Zinc Co. of Tennessee reports encouraging results in the use of ¾-in. hex integral-bit steel with a starting gage of 1⅓-in. Increase in drilling speed, lower first cost in drill steel, a possible saving in explosives and appreciable savings in compressed air are expected over the ½-in. hex steel and 1⅓-in. starting gage previously in use. The latest combination drills a hole with only 33 percent of the volume of the one drilled with the 2¼-in. shell-mounted jackhammer with a 2⅓-in. bit used on the conventional column and arm, prior to late 1952. Tonnage per machine-man-shift

has been boosted from 39 to 67 and cost of drilling and blasting per ton of ore has been reduced from \$0.483 to \$0.388. Air-leg drills have also been successful in driving 9 by 9-ft off-the-track drifts. Jumbos are used in heavy drifting. The latest arrangement finds four 3-in. machines with hydraulic booms mounted on a "Gismo." The machines handle 15-ft, ¾-in. alloy steel with tungsten carbide chisel bits, 1½-in. gauge in the cut and 1⅓-in. in the remainder of the holes; 14-ft holes are drilled without changing steel. Two men operate the four drills, thus effecting a low labor cost. A comparison between jumbo and air-leg drills finds the jumbo giving the lower cost in thick and relatively uniform orebodies. No sharp line can be drawn as to applicability in relation to dip, but it appears that anything over 15° can best be broken with air-legs. Roughly, four such drills can be purchased for one-eighth the cost of a four-machine jumbo. Maintenance cost per foot of hole is less for the airleg but the useful life of each type of equipment has not as yet been determined.

Compare Jumbos and Airlegs

A comparison of performance between jumbo and push-feed drills at the Anaconda Copper Mining Co. at Butte has disclosed that push-feed drills compare favorably in certain headings and under many conditions, indicating preference from a cost standpoint and over-all mining usage. Service life, long-term maintenance and proper round cycling are yet to be determined.

To reduce time, effort and cost in driving headings, the Gardner-Denver Co. has placed on the market a new 2-drill jumbo. The J. S. P. Mobil-



Training programs are necessary to get the most out of modern mechanical mining methods

jumbo features remote drill controls where one man can control all operations from the operator's seat—moving into position, swinging the drills, throttling, feeding, cleaning hole and withdrawing. Various boom lengths are available for drilling faces up to 14 ft high and 25 ft wide. The company is also selling power swing jumbos and remote control drills for mounting on the customer's own equipment. The International Nickel Co. has designed a special drill carriage mounting five air-leg drills to drive an 11 by 12-ft main haulageway at its Sudbury district operations. This unit permitted high-speed drifting for a record of 28 ft in 24 hr at the Levack mines.

TC vs Diamond Drills

Tungsten carbide drilling is making further inroads in longhole work. Development of satisfactory jointed drill rod used in conjunction with detachable insert bits and 3½ or 4-in. heavy drifters, has reduced the cost of blast-hole drilling drastically over diamond drilling in a number of places. The larger holes usually allow greater burdens and produce more tons of ore broken per foot-of-hole drilled. Holes are usually 60 to 70 ft long, but have been drilled as deep as 140 ft.

The diamond drill manufacturers appear to be settling the controversial subject whether the advantages derived from the use of oriented diamonds in bits justify the added cost of producing them. After three years of experimentation, Sprague and Henwood, Inc., completely converted to the use of oriented bits when diamonds larger than 40 per carat were used. Practical data obtained over the past two years indicate an average of 42 percent decrease in cost per foot drilled. Bits with oriented diamonds produced more than double the footage per bit as well as saving



Under certain conditions the heavy drill jumbo produces the best results

drill labor time when compared with bits where the stones were not oriented.

Decentralize Air Plants

Mobile compressor units may be expected to become common underground. Decentralization of compressed air plant is definitely to be preferred in mines of great areal extent where compressed air networks become complex and fluctuating demands cause uneven loading in branch lines. The use of portable compressors supplying hot air directly to rock drills has increased the number of ft drilled per shift by 15 percent to 25 percent compared with the use of cooled air from a remote stationary unit, according to the result of tests carried out by the Atlas Diesel Co. in the Kiruna Iron Ore Mines in Sweden. Improved lubrication with the 165°F air is believed to be the reason. The use of hot compressed air reduces required compressor capacity and tends to eliminate freezing at the drill exhaust. In addition, elimination of pipelines save leakage losses which in some extensive networks are estimated at 15 to 30 percent.

The Kennecott Copper's Utah Operation has developed and uses a special mobile mine drill which has brought about numerous revolutionary changes including: a reduction of 34 percent in the number of employees in the drilling and blasting department; retirement of 60 miles of compressed air line and elimination of the \$105,000 annual cost for operating a central compressed air plant.

Mechanical Loading Grows

Chute loading still predominates in the United States but a growing trend is discerned toward handling of the broken ore directly by mechanical loaders.

An interesting comparison between mechanical loading from drawpoints

with Eimco 21 loaders, and slushing with subsequent drawing through box-holes was reported by the United Montauban Mines in Quebec. During a six-month period, slusher operations showed a cost of \$0.365 and mechanical loading, a cost of \$0.254. Included in the costs are labor, equipment maintenance, power and powder in secondary blasting. The conclusion reached is that the loader-tramming layout has the advantage where sufficient tonnage is available to insure continuous operation. Ability to handle larger pieces in the drawpoints is one of the chief reasons for lower cost.

The Renable Mines Ltd. in Ontario is using mucking machines exclusively in operation at loader drift box-holes under shrinkage stopes. While this type of loading is considerably harder on the Eimco B-12 loaders than mucking in drifts, maintenance cost on the machines over the past year has been only six cents per ton of ore handled. The original chute loading was discontinued when secondary blasting caused an extremely high chute maintenance with attendant loss of time. In comparison, there are no holdups in pulling box-holes as replacement of loaders can be effected quickly.

The Vermont Co. installs mucking machine drawpoints wherever the ore-shoots intersect the main level, thus extracting a minimum of waste, and a maximum of ore with the least timbering and in the shortest time of development. Maintenance was found to be the critical problem, whose solution lay in the inauguration of a planned and recorded maintenance program.

Haulage Trends

Trolley locomotive haulage still remains far in the lead in underground transportation. Conveyor belt haulage and diesel-powered equipment is

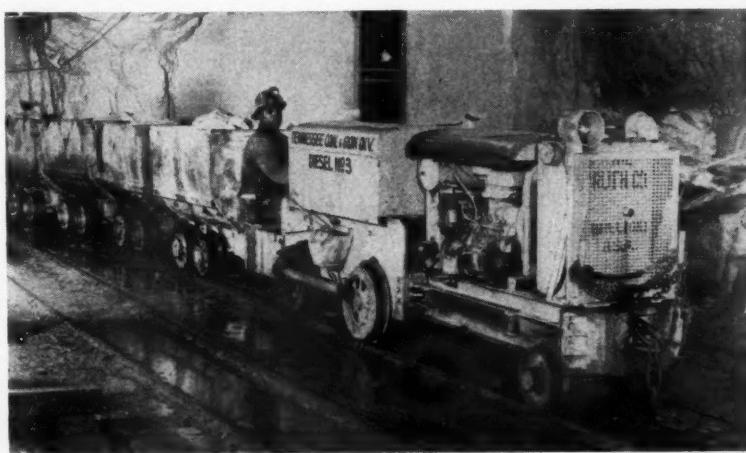
receiving consideration at all new installations. The White Pine Copper Co., in developing a room-and-pillar mining layout, has decided to use 18-ton diesel and diesel-electric haulage trucks to bring the ore to a central underground crushing and screening station. The crushed ore will be transported to the secondary crusher bins by a 2400 tph 54-in. conveyor belt. The length of the belt portal and tunnel will be about 3600 ft.

Diesel locomotives are finding a place in industry. The low cost of diesel operation and maintenance is attractive, even though conditioning of the exhaust still appears to be a problem. The latest remedy for exhaust fumes is a twin-flow heavy-gage steel catalytic muffler made in several models by Oxy-Catalyst, Inc., and called the "Diesler." The unburned carbon monoxide and hydrocarbon fumes of the engine exhaust flow across catalyst-coated rods where they are converted by catalytic oxidation to carbon dioxide and water vapor. The Copley Cement Manufacturing Co. has used the unit on a 4-cycle, 62½-hp diesel tractor-shovel underground without any ill effects or complaints. Carbon monoxide concentration reportedly has consistently been below 0.003 percent (U.S.B.M. allowable maximum is 0.01 percent for eight hrs).

With the advent of increased mechanization in underground mining operations and the steady growth of trackless mining, it may be safe to guess that diesel powered equipment will find common use underground and that mobile and conveyor equipment will give track-type haulage stiff competition.

Adopt Koepe Hoists

It appears that the American mining industry is on the threshold of recognizing the value of the friction type hoist. Initially designed and installed by Carl Koepe in 1877 at the Hannover mine in Germany, its use has spread throughout Europe, where at the present time, drum hoists are employed only in rare instances. The first American installations are at the C-shaft of Cleveland Cliffs Iron Co. at Ishpeming, Mich., where two skip hoists and one cage hoist are being built and at the No. 1 Fecunis shaft of Falconbridge Nickel Mines, Ltd., where two such hoists are scheduled for delivery during the current year. Features which have led to the almost exclusive use of the Koepe hoist in Europe are numerous; the most important ones may be considered to be the use of several ropes in parallel which insures a great degree of safety, elimination of the fleet angle which permits mounting the hoist directly above the shaft, the elimination of cross-overs in multi-layer winding practice, increased



Diesel locomotives are finding a place in the industry



Chute loading still predominates but the trend is toward mechanical loading underground

hoist capacity for useful work, and the low peak power demand resulting from the low inertia of the revolving parts and elimination of flywheel and regulator losses. The chief disadvantage lies in the fact that the rope cannot be lubricated. In mines with acid waters, conventional drum hoists are preferred.

A 500-tph hoisting installation is well under way at the Kiruna Mine where the changeover from open pit to underground operations, begun in 1951, is scheduled for completion in 1957. The expected output of about 15,000,000 metric tons may rate it as the largest underground mine in the world. Hoisting will be done by eight to ten tower-installed four-rope friction type units using 20-ton bottom dump skips.

Semi-automatic, pushbutton control, and fully automatic hoists predominate in Europe. A trend to automatic controls in hoisting is evident in this country. Where such controls are installed, capacity has increased. Precision in acceleration and deceleration permit optimum use of the hoisting machinery.

Vulcan Iron Works has designed a new 90-hp gasoline mine hoist for shaft or slope service at properties remote from electric power. It incorporates safety features not usually found with gasoline equipment. Both hoisting and lowering are performed in gear. Rope pull of 5000 lb, rope speed of 275 fpm and drum capacity of 1000 ft of $\frac{5}{8}$ -in. rope are listed in the specifications.

Bolts Replace Timber

Rock bolting finds an ever-widening application in underground mining. It is now replacing timbering at an increasing rate. Experience has proved that this form of ground sup-

port may be successfully used in blocky ground as well as in stratified rocks. Mechanized mining has provided the impetus, since conventional support restricts maneuverability of equipment. In addition, bolts do the same job faster and cheaper: they may be applied immediately to the existing shape of the excavation, and their volume for storage or transportation is much less than the equivalent timber set. It has been found in some mines that five bolts will normally support as much ground as a set of timber, yet their cost is only one-half that of the timber. The Butte mines are presently using bolts at the rate of 5000 per month and for all types of underground excavations. They are applied in temporary support of cut-and-fill stopes, have been successfully used in shrinkage and square-set stoping, and their use in development headings, shafts and permanent passageways are continually growing. Sunshine Mining Co. at Kellogg, Idaho, has found that the use of bolts in shrinkage stoping increases productivity by three tons per man-shift and shows an economic advantage of 53 percent over the cost of timbering shrinkage stopes.

The U. S. Bureau of Mines reports that during the past six years about 800 mines in the United States have adopted bolting for systematic support and that more than 100 of these mines now use rock bolts exclusively.

Where ground is heavy and applicability of bolts becomes questionable, concreting is employed. Aluminum forms are used for concreting slusher drifts, haulage drifts and shafts at the Jeffrey Mine and advantages of speed in handling and safety due to light weight promise to result in

wider application. Such forms have been in service in slusher drifts for 3½ yrs without replacement. They do not require painting with lubricating oil as they do not stick to the concrete. Steel forms used in sinking the No. 1 main shaft weighed 611 lb for a 3-ft 10-in. by 6-ft section. Aluminum forms measuring four by six ft presently used in No. 2 main shaft weigh only 202 lb. A dolly-mounted arched-back form is used to concrete main haulage drifts. Each four-ft length of forms weighs approximately 2000 lb in steel and 610 lb in aluminum. In ordinary drift locations, crews working with aluminum arched forms accomplish 40 to 50 percent more work than ones erecting arched steel forms.

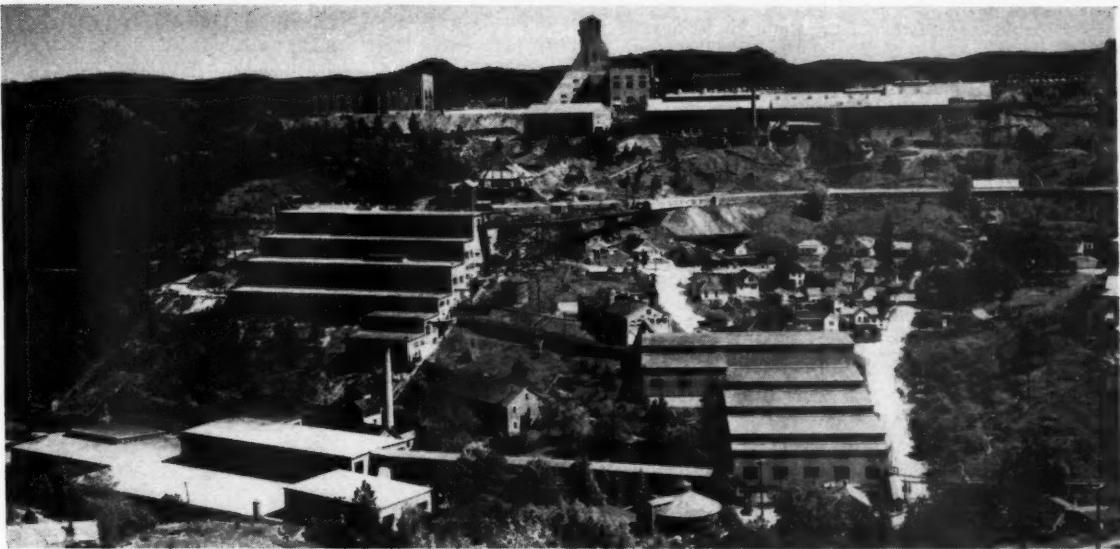
Outlook

The future holds prospects for more wide-spread use of light weight drilling equipment, greater use of underground loaders, a steady growth of trackless mining and diesel powered equipment application, an increased trend to automatic hoisting and a continuing effort for still greater mechanization in underground operations.

As the figure of equipment value per man rises, it becomes increasingly apparent that performance of the mechanical plant depends to a great degree on operator attitude, morale, training and aptitude. The wise mine management insures these qualifications through efficient training programs and the use of proven scientific personnel procedures to fit the man to the job. To obtain maximum benefits from the investment in equipment, personnel policies conducive to the creation of more harmonious employer-employee relations are imperative.



Rock bolts are replacing timber at an increasing rate



Advancing technology helped keep domestic mines in production

Gold Mining in 1954

Another Grim Year for Gold Miners but Prospects Will Be Brighter If Proper Steps Are Taken

By DONALD H. McLAUGHLIN

President
Homestake Mining Co.

FOR the gold miners of North America, 1954 has been another grim year. Wages and the prices of practically all materials employed in the operation of mines and mills have remained at their high level in depreciated paper dollars. The slight drop in the Bureau of Labor Statistics index is unfortunately not reflected in the cost of things consumed underground, a good number of which are actually higher in price than in past years. Consequently the pinch between the fixed price of gold and operating costs is even tighter.

Production from the mines of the continent, however, is up a little, thanks largely to the relief from strikes that handicapped the Canadian gold fields in 1953. The mines in the United States on the other hand will do well to hold their own, and their ability to do this can be attributed to continued improvements with the advancing technology of the times and not to any relaxing of the restrictions that have made gold mining a depressed industry.

Labor has been fairly plentiful and operations are no longer handicapped

by lack of miners, which affords some relief. In Canada, the premium paid by the government on a portion of the production has helped many companies through this benefit, although this benefit is partly offset by the reduced price of gold in Canadian currency resulting from the weakness of the American dollar. Consequently, it is hardly surprising that little interest is shown in prospecting or development of new gold mines in either of the two countries. Only the more robust enterprises, with few exceptions, have been able to maintain their earnings at a tolerable rate and that by dint of truly intense efforts.

Uranium Helped South Africa

The story from South Africa on the other hand, is different. Conditions there afford another example of the old proverb that blessings never come singly.

The benefits of the devaluation of the pound sterling in 1949—or better the sensible adjustment of the pound to the persistent value of gold—though

partly lost during the ensuing inflation of the Korean conflict, are still appreciable. Furthermore, the tremendous investments in the new mines in the Orange Free State as well as along the southwestern extension of the Rand are each month making substantial additions to the gold output. And on top of these benefits in the income now being derived from the uranium content of the gold ores in a number of the old properties as well as in certain of the new mines of the Orange Free State, and on the Far West Rand.

With these three stimulating developments, the gold output has advanced to a new high since the war and is likely to become even greater. The potentialities of the Orange Free State are now becoming more and more apparent as mine after mine comes into operation. The decline in South African gold production, that was feared a few years ago, as the older mines on the Rand deepened, and as many approached the margin of profits that means extinction has now been indefinitely postponed. The new mines of the Orange Free State can confidently be counted on to push the unions, gold production to new peaks and notably extend the life of this great industry on which the economy of the country so largely depends.

The income from uranium will also have a profound effect on the gold output. Prior to this brilliant achievement of winning unexpected wealth from the meager uranium content of the gold ores, it was a safe prediction that production from the Rand proper would fall off rather alarmingly in the relatively near future. Certain large tonnage operations were clearly approaching the limit of profits. The additional income from uranium, how-

ever, saved the situation for them and restored immense reserves of ore that were about to be written off as worthless. With this prolongation of the life of the older mines, the new gold from the Orange Free State will be an increment to the already great output of this dominant gold region and not merely a replacement of the ore from the depleted areas.

London Market Reopened

In the last months of 1954, rates of gold production reached figures close to the all-time record and it is reasonable to expect that the annual output of 14 million ounces which was attained in 1941 may be exceeded, if not this year than surely in 1955.

The stimulation to gold mining derived from the 1949 devaluation of the pound was of course felt throughout the entire sterling area, and its results are now becoming apparent in increased production from Western Australian and other gold districts, though nowhere of the same order of magnitude as in South Africa. The anticipated increase in output of gold in the vast region linked financially to the pound sterling gives the reopening of the London gold market very special significance. It may well mark a beginning of a new tie to gold on the part of these astute people that will prove to be an important step toward eventually reestablishing convertibility of their currencies on a basis that will endure. Possibly it might even result in more enlightened policies with regard to gold on the part of the United States, but our leaders will probably have to learn it the hard way.

It is clear that the British are not going to repeat the mistake of the 20's when the gold standard was resumed at the old price that had prevailed in 1914. The resulting deflation, accompanied by an effort to

maintain prices and wages, resulted in a drastic decline in exports with falling off of business and unemployment. It was really the start of the depression, which became still more drastic by persistence of similar policy with regard to gold in the United States. As it was, the gold standard was wrongly blamed and not the hopeless policy of attempting to maintain convertibility at a false rate. As Charles Rist, one of the world's leading monetary economists has pointed out, it was this attempt to maintain or to retain the old convertibility at the pre-war rate for gold on the part of the major countries, including the United States, that made the world-wide monetary and economic crises of 1929 and subsequent years so severe.

The British will not make this mistake again. But are we going to avoid it?

Convertibility and Gold

World trade on the competitive basis that is surely in keeping with American ideals if not with American practices is not likely to flourish on a long-term basis unless currencies are made convertible once more. This can hardly be accomplished on more than a temporary basis without gold. Acceptance of any irredeemable currency as a unit of measure would surely require a higher degree of faith in the integrity of governments than their records warrant. Gold alone affords an independent unit in which national monetary units can be defined and their relative standing revealed.

Foreign Balances Dangerous

In the post-war years, the large excess of American exports over imports has been met largely by grants for loans, gifts or other forms of financial aid. As a result, our ex-

port market has been artificially maintained by these means of providing the funds by which we can pay ourselves with our own money. By this artificial means not only has the so-called dollar gap been closed, but foreign balances have been built up that amount to claims against our stock of gold that could reduce it to a dangerously low figure.

Recent data indicate that such claims now amount to around \$12 billion. That this could happen in a period when American exports far exceeded imports gives some measure of the extreme to which the policy of foreign aid has been carried. Claims of this magnitude even in the hands of friendly individuals, could be extremely worrisome if confidence in our economy is lost. If taken into account, as they should be, the actual effective gold stocks of the country are only on the order of \$8 billion. This is a dangerously low figure and could easily result in disaster if settlement of foreign claims in gold were pressed.

The United States denies its citizens the right to convert their dollars into gold; but the gold standard at the pre-war rate of \$35 per ounce, established in 1934, is maintained abroad by redeeming dollars at this rate through central banks. Under the increasingly competitive conditions that can be expected with the full industrial recovery of Europe, as well as from the many mines and industries built up with our loans and grants throughout the world, we may before long find ourselves in the most unfavorable situation. The dollar convertible into gold at \$35 per oz may well prove to be overvalued among the currencies of the world, with most serious effects on our ability to sell American goods at prices in dollars determined by the level of wages in this country.

Grants, military aid, loans by Government agencies, tariffs or other subsidies have been and in all probability will continue to be called upon to offset this increasingly painful situation. To date they have worked but with a cost to the American taxpayer that is neatly concealed, at least with regard to purpose. When these artificial and uneven devices are reduced, if not discarded, the effects could well be disaster, if the dollar continues to be overvalued in gold.

What the right price of gold should be—or what the ratio between the dollar and gold should be when convertibility is restored—is perhaps not too clear; but we should be aware of the dangers to our international trade that would be created by an overvalued dollar and not place the risk of repeating the mistakes of the 20's and suffer the same serious consequences by delaying the adjustment in price of gold too long.



World trade is not likely to flourish in long run unless currencies are made convertible

Need Restored Gold Standard

Under present conditions, restoration of the gold standard is more needed than ever. It is essential, if we are to escape from the present reliance on artificial devices—grants, subsidies, tariffs—to maintain our trade! But, it would not be effective unless established with the dollar redefined in terms of gold at a price that is in proper relation to the claims that must be met in dollars, with recognition of existing domestic and foreign price trends as well as stock of monetary gold and anticipated increments to it.

Senate Hearings Valuable

A series of bills related to gold was introduced during the previous session of Congress and lengthy hearings were held on them before the Senate Committee on Currency and Banking. No action resulted but the hearings provided an opportunity for presentation of a wide range of testimony and arguments.

Representatives of the Federal Reserve Bank and of the Treasury, strangely enough, supported the current policy with regard to gold that was inherited from the past administration. One of these spokesmen, however, defended his position on the ground that no change should be made until a balanced budget has been obtained and a more stable economy re-

gained, whereas the other came to the same conclusion on the grounds that present conditions were so good that they should not be disturbed. In spite of this conflict in their reasoning, they were united in supporting the existing system of managed currency with continuation of the restrictions on convertibility and ownership of gold.

Arguments were also presented in favor of restoration of the gold standard without change in the current price of \$35 per ounce. The earnest advocates of this procedure made an excellent case against inflation and the evils of an irredeemable currency, but exhibited their usual unconcern about the danger of deflation and depression arising from such a move. Witnesses for the gold industry also favored restoration of the gold standard with convertibility at a fixed price—but urged that the conversion rate should be such that the move would be neither inflationary nor deflationary. The difficulties of selecting the price of gold that would best attain this desirable end were recognized. As means of determining this critical point, a temporary free market in gold for guidance was urged by several competent economists. Others urged that decision in the gold-dollar ratio be made by an agency of Congress after all pertinent evidence was weighed.

All in all, an excellent record of thoughtful views was built up, which is well worth careful consideration by anyone seriously interested in the gold question.

What Ratio Is Correct?

Arguments on the part of gold producers for a higher price for their metal are, of course, apt to be dismissed as special pleading; but they can be based on the sound ground that restoration of the gold standard with convertibility of the dollar at a price that can be maintained is essential to the welfare of this country and the world—and that the danger of repeating the deflation and enduring a depression comparable to that in the 30's would be lessened, if not entirely avoided, if the proper ratio between the dollar, other currencies and gold can be agreed upon when convertibility is reestablished.

In the meantime the new London gold market will be helpful over the next year, though with the restrictions imposed it is still far from a true exchange. A big step forward that could be easily taken in this country would be removal of the prohibition on ownership of gold by American citizens. At least this would be some progress toward restoring gold to its traditional place and would be in line with steps being taken elsewhere in the free world.

Potash

(Continued from page 70)

the basin. Freeport Sulphur Co. has completed its exploration in Eddy and Lea Counties, and through an interlocking arrangement with Pittsburgh Consolidation Coal Co. a new company has been formed to sink shafts, develop underground workings and construct a surface plant at a total cost reported to be \$15,000,000. The date for starting this operation is not yet known but is expected to be very soon.

The National Farmers Union has entered into an agreement with Kerr-McGee Oil Industries, whereby shafts will be sunk and a pilot plant established on leases owned by the Farmers Union east of Carlsbad. It is reported that work on this property will be started soon.

Prospecting and development continues in Canada, in the Province of Saskatchewan, and the possibility of exploiting potash deposits known to exist in Utah is still under consideration.

Progress in Mechanization

One of the interesting developments in mining at Carlsbad is the competition between continuous mining operation on the one hand, and the mining of potash using the 10RU rubber

tired universal cutter, the multiple drill unit mounted on rubber tires, with conventional blasting and loading with Joy tractor-mounted loading machines. Which will be the most efficient operation still remains to be proven. Roof conditions may well be the answer in any given mining area. The 10RU Universal Cutter will be equipped with a bug duster and is operated by one man. Several of these cutters have been placed in use in the district.

The addition of two new potash mining companies in the Permian Basin, with increased royalty, labor

and freight costs, will require the most efficient and careful operating conditions if the companies are to continue to maintain incomes comparable to those in the past. On the other hand, considerations such as; increasing population, higher standards of living, depletion of soil fertility, and lack of new farm areas to be opened are rapidly convincing farmers of the need to put more mineral fertilizers on the farm, and the long range demand for potash and other fertilizer minerals will continue to grow. Future prospects for the potash industry are bright.



Mechanization with bigger continuous miners and shuttle cars showed continued progress in Carlsbad area



A new world record was established when one 50-yd shovel moved 1,720,000 cu yd of overburden in one month

Strip Mining in 1954

Stripping's Share of Total Coal Production Grows as Emphasis Is Placed on Bigger Equipment

By JAMES HYSLOP

President

Hanna Coal Co. Division of Pittsburgh Consolidation Coal Co.

STRIP mined coal in 1954 represented about 25 per cent of the total bituminous production. The increasing percentage of the available market which is being handled by the open pit mines reflects the economic advantages which they enjoy. Despite these advantages, the low price per ton at which all coal is currently selling is promoting the development of machines and methods calculated to increase production efficiency, or to offset the effect of heavier overburden and other adverse operating conditions. In 1954 definite signs of progress could be observed—some of the more notable trends in this direction are well worth the attention of every operator.

Drilling and Blasting

As the average thickness of the overburden increases, the cost of drilling and blasting becomes more important. The year brought a more widespread use of air blast rotary vertical drills in overburden blasting. In heavy overburden the advantages of this type of drill over the other

types is obvious, particularly where limestone or sandstone is encountered. It is not uncommon to find these newer drills operating at a drilling rate of 1000 ft of hole per shift. Manufacturers are working vigorously on improving the efficiency and capacity of these units, and it is certain that the outstanding success which air blast rotary drilling has achieved is going to be followed by further progress.

In recent years a great deal of work has been done on the development of improved explosives for overburden blasting. During 1954 the use of some of these newer explosives moved out of the experimental into the regular production category. One of the outstanding developments along this line which is receiving widespread acceptance throughout the industry is the use of bulk ammonium nitrate. This material has the advantage of safe handling as it is apparently inert at ordinary temperatures and pressures. The ammonium nitrate is mixed with relatively small amounts of other materials which apparently

help to control the blast characteristics. Detonation of this type of explosive is accomplished by a dynamite primer.

An interesting development in the blasting field is the use of elastic containers. These containers can be sized to the nominal drill hole diameter, then they can be packed into the hole in such a way as to allow the plastic container to expand, filling the irregularities in the hole and eliminating the cushioning effect of voids. The plastic bags also have the advantage of being moisture proof so that the loaded cartridges can be stored for considerable periods of time without losing their explosive strength, and they are unaffected by wet overburden conditions. Common practice is to follow immediately behind the blast hole drill with the charging crew and charge a considerable number of holes and then detonate them altogether, or in sequence by the use of delay caps.

Extensive experimental work has also been done on the use of materials other than lamp black in liquid oxygen blasting, and these experiments seem to afford some promise of the development of a liquid oxygen explosive which will be lower in cost than the types presently in use.

The effect of more economical drilling methods and lower cost explosives is to open up new possibilities in the field of overburden removal. The capacity of existing stripping units can be increased by improved fragmentation and displacement of the overburden by blasting. The thickness of overburden that can be economically handled is also increased thus expanding the field for larger stripping equipment. More efficient blasting and drilling also minimizes the disadvantages of hard rock in the overburden.



Drilling techniques advanced and showed every sign of greater progress

Shovel Advances

Significant progress is constantly being made in the improvement of large stripping equipment. The use of high strength alloy steels combined with increases in power and speed is resulting in spectacular performance records. One 50-yd shovel established a new world's record when it moved 1,720,000 cu yd of rock and shale overburden in the month of October 1954. The use of high strength alloys in dipper construction is becoming more widespread, and as a result dipper sizes are being increased. During the year one manufacturer built a 24-yd bucket for use on a shovel which was originally designed to handle a 17-yd bucket. All of this tends toward higher efficiency and lower costs, making it possible to expand the available reserves of strip coal by making economical removal of thicker overburden.

During the year production started on a super shovel which will be placed in operation late in 1955. This shovel will weigh more than 5,200,000 lb and will be equipped with a 60-cu yd dipper. This machine will be capable of stripping to 100 ft of overburden. It is designed with greatly increased horsepower on all motions so that its speed and digging ability should be in a different category than previous



Trucks having a capacity of 55 tons were placed in service during the year

machines. The main motors are rated at 4650 hp. It will be placed in service in Ohio where it will be used to strip coal in pits where the overburden thickness has exceeded the range of existing machines. It is believed that, with the exception of ships, this huge unit will be the largest individual machine of any kind

ever built by man. Fig. 1 indicates the size of this machine related to more familiar objects.

Larger Trucks Coming

During the year the use of large haulage trucks became more common in the transportation of strip coal. By the use of light-weight construction and engines of over 400 hp, high-speed trucks having a capacity of up to 55 tons were placed in service. The success of trucks of this type and size has now been proven and it is to be expected that their use will become more widespread. Already there is some dreaming about trucks having a capacity of 75 to 100 tons; therefore, we may expect further developments of bigger units.

Reclamation

One of the important operations in connection with strip mining is the reclamation of the stripped areas. The grading involved in doing this work has been performed by large-sized conventional bulldozers. These machines at times have proven themselves inadequate, lacking both the capacity and durability needed for the rugged job of grading some spoil banks. In 1954 much larger bulldozers of somewhat radical design were placed in service on reclamation work. Experience to date indicates that these machines are an outstanding improvement over the conventional types and it is certain that their use will become widespread. One of these new units is equipped with two engines, providing the use of 190 hp. The machine has a flexible connection between the two crawlers, greatly improving its traction and ability to accommodate itself to irregular terrain. Other manufacturers are working on similar developments and it is

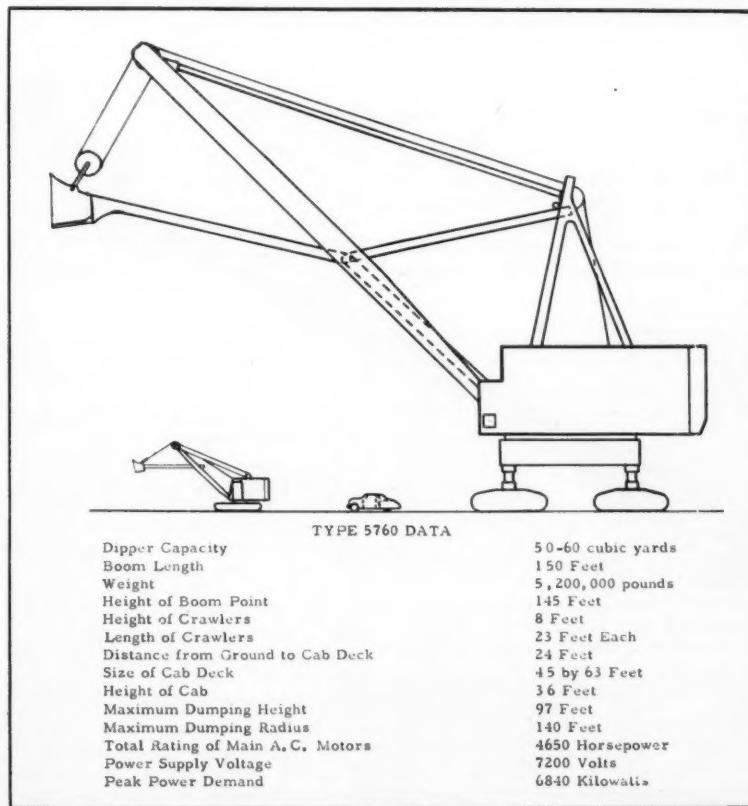


Fig. 1—Comparative sizes: a 60-yd shovel slated to be placed in operation late in 1955, a one cu yd shovel and an automobile



Fig. 2—Significant advances were made in utilizing stripped over land for stock raising and agricultural production

certain that earth moving by bulldozer type of equipment is moving into a new phase. The importance of this is very great to the industry as the cost of reclamation has become increasingly important, and the use of machines better adapted to this work will certainly have a favorable effect on these costs. It is the writer's opinion that even these new machines are inadequate and that there is a definite need for a much larger and efficient unit for spoil bank grading.

Land Utilization

Significant progress is being made in the field of the utilization of stripped over areas for stock raising and agricultural production. A fund

of scientific data is being accumulated on the best methods of promoting plant life in the reclaimed areas. It is obvious that nature's slow process of soil building and the establishment of vigorous and useful plant growth can be greatly accelerated by the application of scientific planting and fertilization methods. Reclamation is no longer confined to forestation, although tree planting is still an important feature in this work. Careful studies of individual areas will reveal the type of planting program best calculated to succeed. Wherever conditions lend themselves to the development of grazing lands this approach would seem to be preferable. Experience has shown that in a period

of from three to ten years after initial planting with forage crops, cattle raising can profitably be carried on. Fig. 2 illustrates the results that can be obtained by intelligent farm management of reclaimed areas. In many cases the agricultural productivity of reclaimed mining areas will be greater than that of the land before it was disturbed by strip mining.

One interesting development concerning land utilization in Illinois consists of an extensive hog breeding project. This project is operated on reclaimed areas in conjunction with crop raising, and cattle grazing on undisturbed areas. Coal is absent in these undisturbed areas. The "pig hatchery" is producing large numbers of pigs, most of which are sold to farmers for fattening. At the present time this project is stocked with an average of 6500 animals.

A curious sidelight of this development is the sale of young pigs through a mail order house. The *Wall Street Journal* recently carried a feature story on the success the Spiegel mail order house is having selling these scientifically raised young pigs by mail. The fact that coal companies have extended their activities into such fields is indicative of the ingenuity and determination with which every phase of the coal stripping business is being pursued by mine management which is characterized by alertness and courage.

Mechanical Coal Mining

(Continued from page 74)

this type of mining system is high. Operating crews are usually small, four to six men, and productivity high, 40 to 60 tons per face man-day. As in conventional mining the shuttle car works between the loader and the belt or mine cars for transportation to surface.

(E).—Continuous Mining Machines (7) Extensible Belt (13) thence to Mine Cars (33) or Belt (31) for transportation to surface. This method of mining coal is the simplest devised so far and is destined for wide acceptance and use. In the first place the number of working places needed to produce a given tonnage is reduced to a minimum—one place per loader. Thus we have attained 100 percent concentration.

Moreover, ventilation and roof control are greatly simplified, and standardized. The system is applicable in districts where pillars are mined, and also in districts where pillars are left.

Transportation of coal from the loader to the surface is also simple. With the extensible belt the loader works at greater efficiency than with any other system so far developed—about 80 percent of the loading time. Only mechanical breakdowns, roof falls, or belt trouble stops the loader

from loading coal. Transportation, from the extensible belt can be to another belt, or into large mine cars for transportation to the surface.

With this system, productivity has been raised to near the upper limits of desirable attainment. The attainment of 100 tons per face man-day has been the ideal or goal for mining men for years. Today several installations us-



A form of coal mining that is receiving more and more favor—the use of continuous mining machines and extensible belts

ing the continuous miner and extensible belt combinations have produced over 90 tons per man-day on a single shift, and have maintained 80 tons per face man-day for a weekly period. On the basis of a \$20.00 wage scale, these



operations are producing coal for \$0.25 per ton face labor cost.

Furthermore, there are many operations today where an average of 50 tons per face man-day is maintained for a week or even longer periods, a labor cost of \$0.40 per ton. The writer knows of several operations regularly producing 25 to 30 tons per man-day over-all, surface and underground labor. On this basis these companies are producing coal to railroad cars for \$0.80 per ton labor cost.

Eventually, with modern mine mechanization, such costs will be commonplace. Then there will be no question as to the superiority of coal versus gas and oil—on a—cost, per Btu basis. Coal will again be "King" and regain the lion's share of the energy market.

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What constitutes a mineral property was redefined

What 1954 Meant to Mining—Taxwise

New Code Liberalizes Depletion Treatment; Removes
Some Uncertainties

By WILLIAM I. POWELL

Associate Editor
Mining Congress Journal

THE 1954 Internal Revenue Code, which became law August 16, 1954, made sweeping changes in the Federal tax structure. This much needed tax reform is the result of many months of comprehensive study and consideration in which the American Mining Congress under the leadership of its Tax Committee Chairman, Henry B. Fernald, took a leading part. While not perfect, the new law does go a long way toward meeting its announced purpose "to remove inequities, to end harassment of the taxpayer and to reduce barriers to future expansion of production and employment." Highlighting these changes are many provisions which directly concern the mining industry.

New Depletion Provisions

The new law contains a broadened and liberalized definition of "mineral property" for the purpose of computing depletion allowances. A mining taxpayer may now elect to aggregate and treat as one property, for purposes of both percentage depletion and cost depletion, two or more separate operating mineral interests which constitute part or all of an operating unit. Thus the mine operator may combine separate mineral interests if they constitute all or a part of an operating unit, whether or not they are included in a single tract or parcel of land, and whether or not they are included in contiguous tracts or parcels of land.

The Senate report explains that the term "operating unit" is susceptible of a reasonable interpretation and "in general the term contemplates aggregation only of interests which may conveniently and economically be operated together as a single working unit." The report also points out that interests which are geographically widespread may not be considered parts of the single operating unit merely because one set of tax records is maintained by the taxpayer or merely because the products of such interests are processed in the same treatment plant.

In a step designed to simplify depletion allowances the new Code places in a "blanket" classification a large number of nonmetallic minerals, including those for which percentage depletion has not heretofore been allowed. This new category covers most of those minerals which had had a 15 percent rate, together with calcium carbonates, magnesium carbonates, and dolomite for which the rate was raised from 10 percent to 15 percent, and includes "all other minerals" not otherwise specifically designated in the law. Minerals included in this category will generally receive a 15 percent depletion rate unless used or sold for use by the mine owner or operator as "riprap, ballast, road material, rubble, concrete aggregates, or for similar purposes"—in which case the rate will be five percent. The tax writers expressly excluded from the "all other minerals" classification "soil, sod,

dirt, turf, water or mosses; or minerals from sea water, the air, or similar inexhaustible sources." Inclusion in the law of this broad all-inclusive classification made it unnecessary to continue the discovery value depletion provisions of prior law.

Increase Uranium Allowance

The 1954 Code increased the depletion allowance for uranium from 15 percent to 23 percent. It also provides, if from deposits in the United States, the 23 percent rate for "anorthosite (to the extent that alumina and aluminum compounds are extracted therefrom), asbestos, bauxite, beryl, celestite, chromite, corundum, fluorspar, graphite, ilmenite, kyanite, mica, olivine, quartz crystals (radio grade), rutile, block steatite talc, and zircon, and ores of the following metals; antimony, bismuth, cadmium, cobalt, columbium, lead, lithium, manganese, mercury, nickel, platinum and platinum group metals, tantalum, thorium, tin, titanium, tungsten, vanadium, and zinc." In providing a higher rate for the domestic mining of these minerals, Congress departed from previous provisions under which percentage depletion was extended to minerals at the same rate wherever mined. During consideration of the new Code in answer to proposals that the increased rates be allowed to other minerals as well, Senate Finance Committee Chairman Millikin declared that such proposals could not be accepted due to the loss in revenue to the Government that would be entailed.

The new law raised the percentage depletion allowance for sodium chlo-



Deduction for exploration expenditures was increased to \$100,000

ride (salt) from five percent to 10 percent and increased the rate for granite, marble, slate, and "stone (used or sold for use by the mine owner or operator as dimension stone or ornamental stone)" from five percent to 15 percent. The intent of Congress was made clear in the Senate Finance Committee report which said that the effect of the specific changes in the depletion law "is to increase the allowable rates in some instances, but to make no reductions as compared either to present law (1939 Code) or the House bill."

The 1954 Code also contains another new provision which makes it clear that percentage depletion is allowable to mine owners and operators

on the extraction of ores or minerals recovered from waste or residue from prior mining operations. In this regard the Senate report points out that "the provision does not apply in the case of a purchaser of such waste or residue or to a purchaser of rights thereto," but explains that the term "purchaser" does not apply to a lessee upon renewal of a mineral lease, "if such lease was entitled to depletion in respect of the waste or residue prior to the renewal of such lease." The new law makes it plain that percentage depletion is allowable on waste or residue in the case of a successor in interest in a tax-free change.

The new tax code makes several changes in the statutory definition of "ordinary treatment processes" which are includable in computing "gross income from the property" in determining percentage depletion allowances:

It specifically includes as an ordinary treatment process the pulverization of talc. It will be remembered that the "International Talc Case" held that the fine grinding of talc was includable as an ordinary treatment process; however, the Internal Revenue Service did not recognize this decision. The new code would seem to clarify this point. The burning of magnesite, and the sintering and nodulizing of phosphate rock are now also specifically includable as ordinary treatment processes.

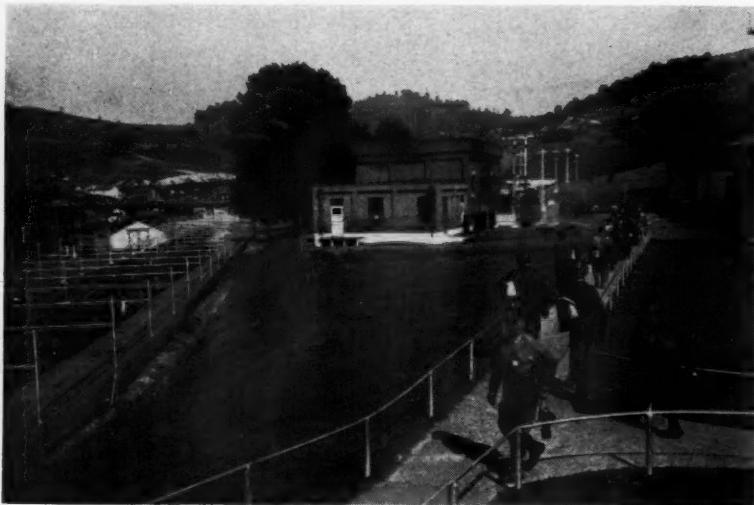
In the case of coal, dust allaying and treating to prevent freezing are added as ordinary treatment processes.

Net Loss Deduction

The 1954 Code contains another provision of major importance to the mining industry. It amends the net loss carry-over provision to eliminate the "adjustments" required in prior



Freeze-proofing and dust-allaying expense is included in "ordinary treatment processes"



Payments to Welfare Funds are defined as ordinary business expenses

law under which percentage depletion was denied both in the year of loss and in the year or years to which the loss was carried. Similar relief is provided for dividends received by a corporation. Thus, for taxable years ending after December 31, 1953, the amount of a net operating loss is to be computed without disallowance of percentage depletion and with full allowance for the dividend deduction without limitation to the percentage of net income. The amount of such loss which may be deductible in any year is not to be reduced by percentage depletion or the dividend allowance for the year of net loss deduction or for any other year or years.

More for Exploration

The new Code increases from \$75,000 to \$100,000 the sum that may be deducted for mine exploration expenditures. A mining taxpayer may deduct this sum currently, or may elect to defer any part thereof, for any four taxable years.

Can Deduct Welfare Fund

A provision of major consequence to coal producers makes it clear that amounts paid to employee welfare funds, such as the United Mine Workers' Welfare Fund, are deductible to the employer as ordinary and necessary business expenditures.

Allows Depreciation Choice

Allowance for depreciation is applicable to all taxpayers but it is briefly mentioned here because of its importance to the mining industry.

Depreciation provisions of the 1954 Code carry forward the same general concept of depreciation as a deduction in computing taxable income which has long been expressed in our income tax law and regulations. In the past,

however, taxpayers have been confronted with great uncertainty as to the depreciation allowances which might be permitted for recoupment of their investments in depreciable property. The provisions of the new Code are intended to remove some of this uncertainty and to give better assurance that depreciation will be reasonably allowed. Under the new law, with respect to property "new in use" after December 31, 1953, taxpayers may make a selection of a depreciation method from any of the following: (1) the straight line method at a uniform rate per year over the useful life of the asset; (2) the declining balance method, at a rate twice that of the straight line method for the first year and at the same rate on the undepreciated balance in each succeeding year; (3) the sum-of-the-years digits method, which also provides a higher deduction at the out-

set, declining progressively in later years; and (4) any other consistent method which will not grant more in cumulative allowance during the first two-thirds of the useful life of the property than the cumulative amount of allowances under the declining balance method.

The taxpayer need not select a single method as applicable to all newly acquired property, but may select one of the methods for certain property and any other of the specified methods as applicable to any other property. After once having selected a method the taxpayer will be bound to continue the method thus selected except that he may at any time elect to change from the declining balance method to the straight line method.

Other Changes—Outlook

The year 1954 saw other changes in our tax laws affecting the mining industry, including retention of the 52 percent corporate tax rate and some reductions in excise taxes. Also, many important administrative tax rulings which concern mining were published during 1954.

At present the Internal Revenue Service is busily compiling regulations to accompany the provisions of the new Code, and it is expected that these will be completed during 1955. It is to be hoped that these will carry out the Congressional intent behind this constructive legislation.

As to what lies in store for 1955, it can be reliably predicted that Congress will extend for at least another year beyond their April 1 expiration date the present corporate and excise tax rates. What other tax changes may come forth is a subject too much in the realm of conjecture for a statement at this time.



Record keeping for tax purposes has become an item of major importance and cost



Taylor-Knapp operations at Phillipsburg, Mont., shipped about 2500 tons per month to the stockpile

Manganese in 1954

Abundant Supply, Lower Imports, Prices and Consumption Mark Year in Which Domestic Output Rose About 20 Percent

By F. A. McGONIGLE

Vice-President and General Manager
Manganese, Inc.

FOREIGN ore was in abundant supply; consumption and price dropped significantly on account of the decline in steel production; domestic production of ore showed a slight gain; and the stockpiling program of domestic ores was subject to considerable criticism. These data cover the highlights of the manganese industry for 1954.

Imports of foreign manganese in the form of plus 35 percent ore in 1953 amounted to 3,514,353 short tons. For 1954 the United States Bureau of Mines estimated that the figure was about 2,400,000 short tons; some 1,100,000 fewer short tons as a result of the lower steel output. Ferromanganese imports in terms of ore were estimated at 110,000 short tons versus 125,000 tons in 1953. Domestic mine shipments for supply and consumption in 1954 were estimated to be 194,500 short tons or 33,000 short tons more than the 161,800 short tons the previous year.

Consumption of ore, including ferro-

manganese in terms of ore for 1954 was estimated at 1,690,000 short tons compared to 2,254,000 short tons for 1953. Domestic production accounted for only 7 percent of requirements in 1953. It was 11.5 percent in 1954.

Russia re-entered the world market and was reported to have sold the United Kingdom 93,000 tons of ore during the year ending May 1954. In December, the Amtorg Trading Corp. offered to trade the United States manganese for butter and edible oils. Assistant Secretary of Agriculture Butz reiterated Secretary Benson's contention that the prime consideration in dealing with Russia is "whether it is to the advantage of the United States . . ." to make the barter or straight sales, as the case may be. No action was taken.

Price Down

In January, foreign ores were bought at \$1.08-\$1.10 per long ton unit for customary grades and terms.

Long term contracts were at \$0.90 per long ton unit. By October-November prices declined to \$0.70-\$0.75 per long ton unit with distress shipments lower. Demand improved by December and prices increased to \$0.75-\$0.80 per long ton unit with long term contracts \$0.05 per ltu less.

Ferromanganese dropped \$10.00 to \$190.00 per net ton 74 to 76 percent Mn, f.o.b., at production plants in Pennsylvania, Ohio, West Virginia and Alabama.

Estimated purchases, disregarding recovery, for the stockpile program initiated in 1952, are tabulated in Table I.

It appeared that 6,000,000 "contained" units of manganese would be reached at the Wenden depot by mid-December and purchases would cease. Taking heed of the strong protests of the shippers to this depot, the Office of Defense Mobilization ruled that purchases at all depots would be based on recoverable units of manganese, and consequently the program at Wenden was given a reprieve of about five months.

It is noted that purchases under the nationwide program amounted to some 1,800,000 long ton units, or slightly less than 10 percent of the program. The Office of Defense Mobilization stated that this goal will be increased in the interest of developing and maintaining our domestic mobilization base should the program be saturated before the expiration date of June 30, 1958. This statement might be interpreted to mean that ODM does not expect the quota to be filled and that it prefers to purchase plus 40 percent Mn specification ore

and eliminate the lowgrade purchases.

Producers of manganese in Virginia appealed for a buying station, but ODM and General Services Administration took no action. Apparently the feeling of these two agencies was that the nationwide program was established for not only Virginia but all areas not included in the other four buying stations. Since no low-grade material was bought in Virginia, the ores produced there were beneficiated to merchantable grade by log washing, jigging and tabling.

The Anaconda Copper Mining Co. continued to be the nation's most important producer of manganese for direct consumption in industry. Beneficiation of rhodocrosite ore assaying 15 percent was at its full rate of approximately 1675 short tons per day from the beginning of the year with a minor seasonal decline until the latter part of August, when all Montana operations were closed by a strike. Production from the Emma Mine was resumed after the strike, but the nodulizing kiln at Anaconda remained down for repairs. Production of nodules for the eight months of operation averaged 8200 long tons per month for a total of 65,600 long tons at an average grade of 58 percent Mn, 6.5 percent SiO₂, 3 percent Fe and 0.07 percent P.

Manganese, Inc., at Henderson, Nev., started milling operations in January and production of nodules was steady throughout the year. A total of approximately 86,000 dry long tons averaging 46.9 percent Mn and 12.6 insol, 1.36 percent Fe and 0.02 percent P were shipped to GSA stockpile.

Pioche Manganese Co. at Henderson, Nev., reached full furnace capacity producing both ferromanganese and silicomanganese from a blended

Place	Authorized Recoverable Long Ton Units	TABLE I	
		Estimated Through 1953 Contained Long Ton Units	Estimated Through 1954 Contained Long Ton Units
Wenden, Arizona	6,000,000	2,089,283	6,100,000
Deming, New Mexico	6,000,000	789,618	2,100,000
Butte } Montana	6,000,000	428,800	1,350,000
Philipsburg—Highgrade Program	19,000,000	557,252	1,800,000

furnace feed composed of domestic and Mexican ores. Estimated production for the year was 20,000 tons of ferromanganese and 2400 tons of silicomanganese.

Taylor-Knapp operations at Philipsburg, Mont., shipped about 2500 tons of 18 percent Mn ore per month to the Philipsburg stockpile.

Teekay Mines' operation at Tracy, Calif., treated an average of 2500 tons of 18 percent Mn ore per month, with the concentrate being sold primarily for battery use.

Trout Mining Division of the American Machine and Metals, Inc., produced 13,200 tons of battery grade 68 percent MnO₂ and shipped 5000 tons of 23 percent MnO₂ and 5000 tons of carbonate ore to the stockpile at Philipsburg.

Activity in Arizona was stepped up with Al Stovall and Associates being the largest of some fifty shippers to the Wenden depot from the Artillery Peak, Superior and Flagstaff regions. Other shippers contributed lesser tonnages to the Wenden stockpile, including ore sources in California.

In New Mexico, Haile Mines, Inc., started its heavy media plant at Hillsboro, and shipped to the Deming stockpile. There were other shippers

of small tonnages from various other deposits.

Geneva Steel Co. purchased limited tonnages of ore from Nevada and Utah sources.

Western Electrochemical Co. at Henderson, Nev. increased capacity to approximately 12 tpd of synthetic electrolytic manganese dioxide for use in high performance batteries. A small tonnage of metallic manganese also was produced.

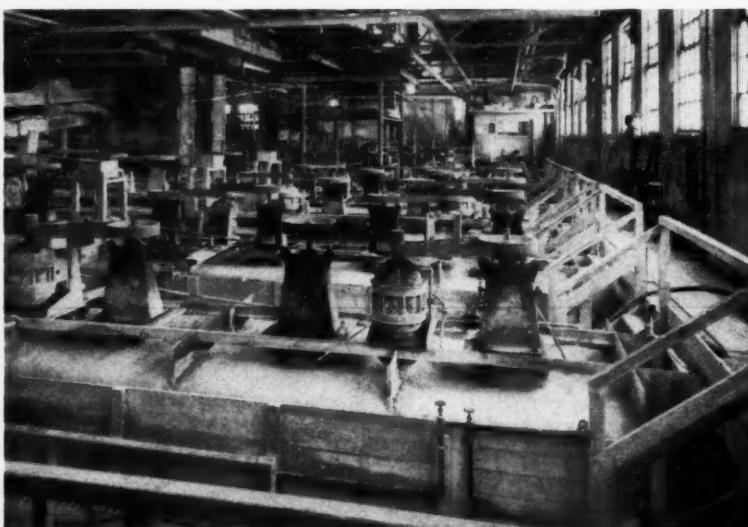
In Virginia the R. Green Annan interests shipped 7856 long tons on the carlot program. The 14 active companies in that State produced approximately 24,000 long tons of plus 40 percent ore.

Small tonnages of plus 40 percent Mn ore came from Arkansas, the principal producers being Leonard Baxter and C. C. Sims of Cushman. The Tennessee Manganese Co. shipped a small tonnage out of Tennessee.

In the field of electrolytic manganese Electro Manganese Corp. of Knoxville, Tenn. was an important producer, and the Electro Metallurgical Co. started a new electrolytic manganese plant at Marietta, Ohio.

Private research on processes to treat lowgrade manganese ore was limited. The E. S. Nossen Laboratories of Paterson, N. J., were working on silicate ores from Aroostook County, Me., with a nitric acid leach. Manganslag, Inc., continued experimental work at Pittston, Pa., treating basic open hearth slags. Southwestern Engineering Co. completed its research contract on wad ores.

The research program of the U. S. Bureau of Mines was noteworthy. Work on the recovery of manganese from open hearth slags and the complex lowgrade Aroostook deposits was centered at Pittsburgh, Pa., and College Park, Md., whereas the broad investigation of methods for extracting manganese from the large reserves of manganeseiferous iron ore of the Cuyuna Range were centralized at Minneapolis. Important studies of manganese alloys and electric furnace production of silicomanganese and ferromanganese were conducted at Rolla, Mo., and Albany, Ore. Most of the work on western ores was centered at Salt Lake City, Utah, and Boulder City, Nev. The Salt Lake



Anaconda Copper Mining Co. continued to be nation's most important producer of manganese for industry



Manganese, Inc. at Henderson, Nev., started milling operations and produced nodules throughout the year

staff, in addition to testing manganese ores submitted to the Wenden and Deming depots, did research in mineral dressing, leaching, sintering, and smelting of oxide, silicate and carbonate ores and concentrates, to point the way toward future utilization of our lowgrade and complex western resources. Problems under study at the Boulder City plant include treatment of 5 percent ore from the Artillery Peak deposit and the lowgrade ores of the Boulder City deposit, development of better and cheaper oil-emulsion flotation methods, cyclic sulfur dioxide leaching of manganeseiferous iron ores, and deep-shaft electric furnace smelting of off-grade manganese concentrates, to produce standard ferromanganese. Research also was in progress on production of battery-grade oxide.

To Review Stockpile Needs

A study of the Government's policy on manganese indicated that the total stockpile objective would be re-evaluated to determine just what the mobilization base for this material should be. Not only have limited technological advances made available (at a higher price) known or newly discovered domestic ores but also discoveries of substantial tonnages of highgrade ores in Brazil and Mexico have reduced our dependency outside the Western hemisphere.

President Eisenhower's press release of March 26, implied that ODM would initiate programs to convert to industrial use the lowgrade ores purchased under the stockpile program. Defense Mobilization Order I-13 of November 12, 1954, assigned defense mobilization responsibilities to the Department of the Interior to cover among various industries those of specified metals and minerals including manganese, for assigned as-

pects of production and processing and to encourage exploration, development and mining. Among further obligations, was one to assist ODM in formulating plans to acquire and stockpile strategic and critical materials and the expansion of domestic sources of supply.

The press release of December 1, 1954 by James C. Hagerty, Press Secretary to the President, covered the report of the Cabinet Committee on Mineral Policy. This report affirmed the aforementioned ODM Order I-13 in general terms and seven of the eleven recommendations favored an orderly and vigorous development of domestic mineral resources. In helping to achieve this end, con-

tacts between the mining industry and the Government must be established and maintained.

So much now for the rhetoric issued from authoritative government sources. The next step is to determine how these hoped-for policies will be carried out.

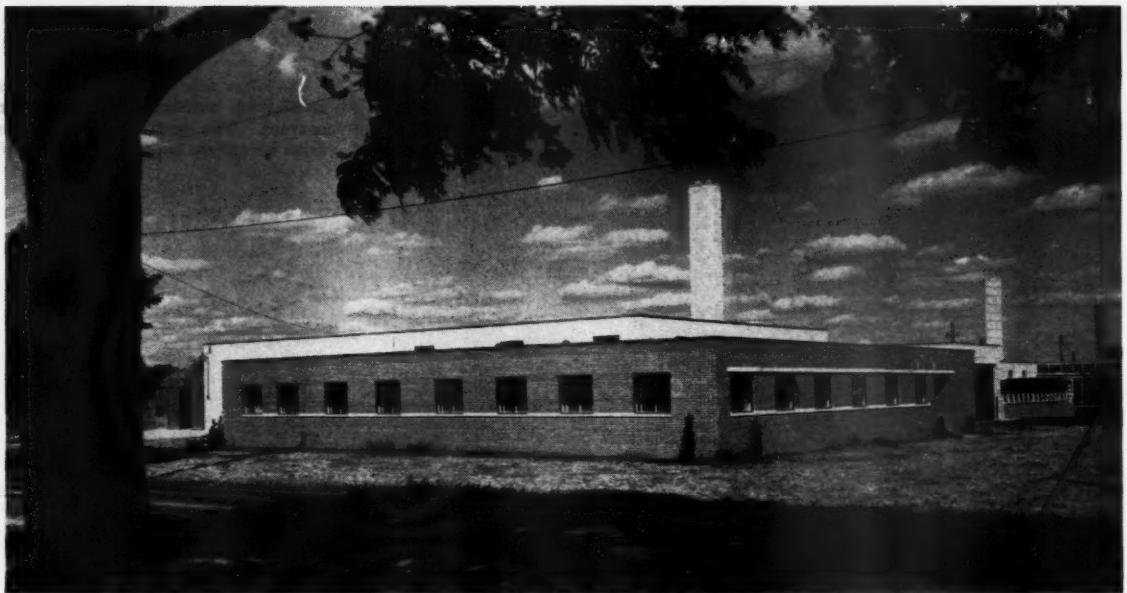
The manganese buying programs have led to the discovery of more lowgrade ore chiefly in Virginia, Nevada, Arizona and California. This is a notable advance in less than three years. It is true that large stockpile accumulations have been made, but are they large enough? This is a crucial matter.

If the emphasis on accumulations of manganese is limited to the present authorized programs, or if all attention is diverted to research to determine the methods to beneficiate these lowgrade ores, then a grave mistake will have been made. Take for example the Wenden station which could be the first one to fill its quota. The 7,500,000 units at an average grade of 20 percent Mn represent only some 375,000 tons of ore. Does this amount of ore warrant the building of a processing plant? The answer must be determined so that lowgrade ore acquisitions can be continued uninterrupted.

If war comes, shipments of ore from India and Africa will be difficult to maintain. The best protection afforded these sea lanes will not guarantee delivery of adequate supplies of ore. Domestic ores will have to make up the deficiency and therefore the treatment processes must soon be perfected, ample tonnages be available, and new deposits be developed. The security of our country demands this degree of preparedness and protection.



Western Electrochemical at Henderson, Nev., produced synthetic electrolytic manganese dioxide for use in batteries



Bituminous Coal Research, Inc., dedicated first industry-owned and operated coal research laboratory

World Coal Research in 1954

World-Wide Study Intensified As Industry Seeks Diversified Markets

By J. W. IGOE and H. J. ROSE

Respectively, Director of Information; and Vice-President and Director of Research, Bituminous Coal Research, Inc.

BITUMINOUS Coal Research, Inc., the national research association for bituminous coal, surveyed all coal research activities known to it to discover as completely as possible the nature of coal research activities during 1954. As is common in such surveys, a few organizations conducting research projects on coal or its utilization did not make information available for business reasons. In addition, Anthracite Institute, which conducted a major research program for the anthracite industry for a number of years, discontinued operation early in 1954. This article summarizes the projects reported.

Properties of Coal

During 1954, Alabama State Mine Experiment Station began research on the relationship between the rank and composition and geological factors of coal. They continued their determination of bright coal, dull coal, and fusain contents and free swelling properties of Alabama coals. Work at this station is continuing on the rate of oxidation of bituminous

coals and their various petrographic components with nitric acid and the use of these rates to estimate the petrographic composition and the chemical reactivity of the coals. During the year, they published a 56-page report on "Breakage Characteristics of Some Alabama Coals."

Eastern Gas and Fuel Associates conducted plasticity studies on various coal mixtures. The State Geological Survey of Illinois, through its detailed study of strippable coal reserves, revealed new information on potentially minable coal seams in that state. Their project of mapping coal-bearing counties in Illinois is continuing. Their study of botanical constituents of coal, which has included correlation studies using plant spores in coal, have been useful in correlating coal seams in areas of new exploration and areas in which coal seams have erratic thickness. They have also established the relationship between atmospheric oxidation and coking property of Illinois coals and have studied the reactions of coal with oxygen and other oxidizing agents.

The Ohio Geological Survey conducted four projects on coal reserves in Ohio, and a cooperative project with the National Science Foundation on the petrographic content of Ohio coals. They also cooperated with Ohio State University on washing characteristics of Ohio coals.

At Ohio State University, methods of analyzing and testing coal have been studied to select and develop better analytical methods for coal research. At the same institution, fundamental properties of the Meigs Creek coal bed have been explored and catalogued.



Illinois State Geological Survey measured pressures exerted on walls of experimental coke oven during coking

Pennsylvania State University has been continuing its research on the constitution of coal, the fusibility of coal ash, and has made infra-red studies on coal and related substances.

The U. S. Bureau of Mines cooperated with the Economic Committee for Europe by analyzing exchange samples of lignites and brown coals from several European countries and the United States to aid in developing an international coal-classification system for low-rank coals. Special tests on typical American bituminous coals indicated the position of these coals in the tentative international standard classification system for higher-rank coals promulgated in Europe in the summer of 1952.

Bureau of Mines tests of a method of petrographic analysis using reflectivity techniques showed a difference between samples prepared from a large single piece of coal and those prepared from briquetted granules, and further work is in progress to refine the techniques.

Fundamental research at the Bureau of Mines encompasses X-ray diffraction studies at small angles to determine the size and structure of the crystalline components of coal, spectrometric work on the functional groups in coal, solvation and other chemical studies, correlation of reflectivity of powder compacts with rank, and kinetic experiments to elucidate the action of gases such as oxygen, steam, and carbon dioxide on coal. Projects have recently been started on magnetic properties of and bacterial attack on coal.

A Bureau-sponsored conference on coal petrography was held in Pittsburgh, Pa., in November.

Recent laboratory experiments by the U. S. Geological Survey have shown that important amounts of uranium are found in lignite beds in the buttes north of the Black Hills in North Dakota, South Dakota, and Montana. These are low-grade compared with uranium sources now available, but are considered to be strategic reserves.

In work already in progress for two years, Virginia Polytechnic Institute is continuing its research on physical properties, washability, friability, and grindability of Virginia coals.

Production and Preparation

It is known that intensive development work is taking place on mining equipment throughout the mining equipment industry. This field of endeavor is so competitive that little publishable information is obtainable from the source. It is expected that individual company announcements will clarify this situation in the near future.

During the past year the use of factory-type illumination underground has been investigated for its effect on

production by the Mining Development Program of Bituminous Coal Research, Inc. Development of equipment to complement continuous mining machines has been undertaken and roof support in relation to accelerated mining has received attention.

Fuel Research Laboratory, Inc., reports further development on coal blending and testing equipment.

Heyl and Patterson, Inc., is investigating thermal drying of coal and is conducting exploratory work with cyclones to improve recovery efficiency, more effective desliming, and sharper classification.

The Illinois State Geological Survey is continuing its study of geologic factors contributing to the quality of coal mine roof with special emphasis on shale.

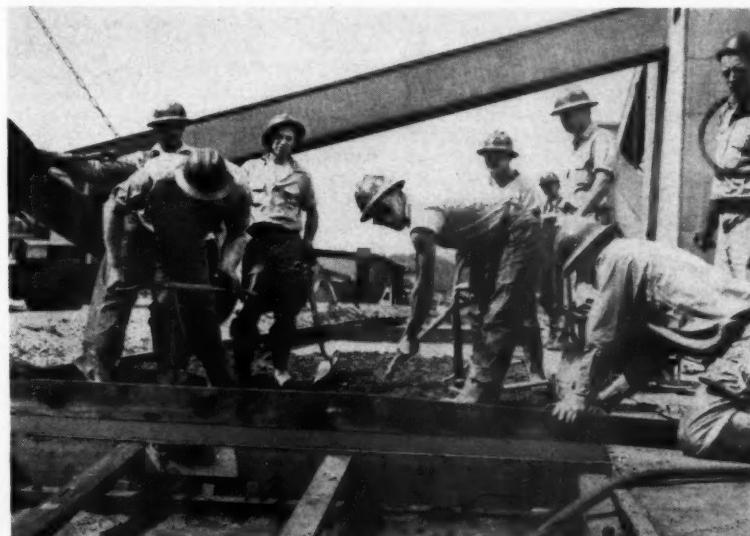
Coal waste is being investigated as a source of sulfur by the University of Kentucky.

Ohio State University is doing research on ash and sulphur reduction and other washability characteristics of coal. In this project they have investigated the effect of crushing on ash and sulphur reduction.

One of the major completed projects of Pittsburgh Consolidation Coal Co. has been the research and development on hydraulic transportation of fine coal through pipe lines. This project was carried through the pilot plant scale which included pumping 8000 tons of slurry a day through pipe lines, development pumps, corrosion control, etc. This development now nears commercialization according to a Pitt Consol report.

The U. S. Bureau of Mines published five reports of known recoverable reserves of coking coal for counties in West Virginia, eastern Kentucky, and Tennessee.

Four German coal planers were in operation on longwall faces in this



Fly ash was used experimentally as partial replacement for Portland cement in concrete road construction

At Mellon Institute study of the bacteriology of bituminous coal mine effluents has resulted in a better understanding of the bacterium responsible for enhanced acid production from certain sulphuric materials associated with bituminous coal. No feasible or economical method has been discovered for preventing the formation of acid mine water. Control of strip mine drainage developed at Mellon, under a joint project with The Pennsylvania Sanitary Water Board and coal producer associations, is proving effective. They have also recommended methods of constructing refuse piles that assure resistance to ignition. These methods are based on procedures, singly or in combination, of compacting, sealing, and crushing the refuse.

country and the U. S. Bureau of Mines continued its cooperative studies and engineering assistance in these operations. After a study of American-made continuous coal-mining machines in commercial mines in six Appalachian-area states, the Bureau published a report on the operation of these machines under a variety of mining conditions, showing substantial increases in productivity per man-shift over conventional methods where the conditions for use of these machines are favorable.

In anthracite mining the use of both pneumatic and mechanical methods of stowing breaker waste material was studied for use with pillar-recovery methods, and it was shown that with backfilling and the use of yielding steel props, the coal could be re-

moved without breaks in the roof or surface subsidence. Properly designed lightweight aggregate concrete roof support members on trial in mine installations continued to be satisfactory after one to two yrs service.

The project on underground gasification at Gorgas, Ala., has been reactivated to study application of hydraulic fracturing to establish passages in coal seams without extensive mining preparation of the site. The project is operated jointly by the Alabama Power Co., Stanolind Oil and Gas Co., and the U. S. Bureau of Mines.

The U. S. Bureau of Mines coal-preparation pilot-plant units have tested methods of cleaning fine sizes of coal using concentrating tables, a feldspar jig, heavy-medium separators, and the kerosine flotation process. Major attention was directed to improving throughput without materially lowering the quality of the cleaned product. To provide data for improving plant operations and equipment design, the Bureau of Mines conducted fundamental studies on the behavior of dense mediums, including such items as the relations between specific gravity and viscosity of such mediums. The Bureau published reports giving the preparation characteristics of coals from Raleigh County, W. Va., and Putnam County, Tenn., to supplement data on coking-coal reserves.

Various types of crushers were

tested on anthracite and lignite. The objective with anthracite was to obtain maximum amounts of buckwheat and rice sizes, with a minimum of smaller sizes. With lignite, minimum power requirements and minimum production of fines were sought. Drying of lump lignite with high-pressure steam yielded data on optimum conditions as regards steam consumption and size of dried product. The full complement of nine 50-tph fluidized bed lignite dryers were completed, and used as demands required at the Rockdale, Tex., plant of the Aluminum Co. of America, with Bureau engineers cooperating in observation of the performance of these units designed from Bureau pilot-plant tests.

The Bureau of Mines studied fundamental factors in the pneumatic transportation of pulverized coal in pipes, and cooperated in the development at Rockdale, Tex., where lignite dried in fluidized-bed dryers is moved pneumatically several hundred feet from the drying plant to the power-plant boilers, where it is burned without further size reduction in conventional pulverized-fuel burners.

A coal product containing less ash than the petroleum coke presently used for electrode carbons was produced in a Bureau of Mines laboratory, where the studies of ultrafine cleaning of coal were continued to improve methods and recovery.

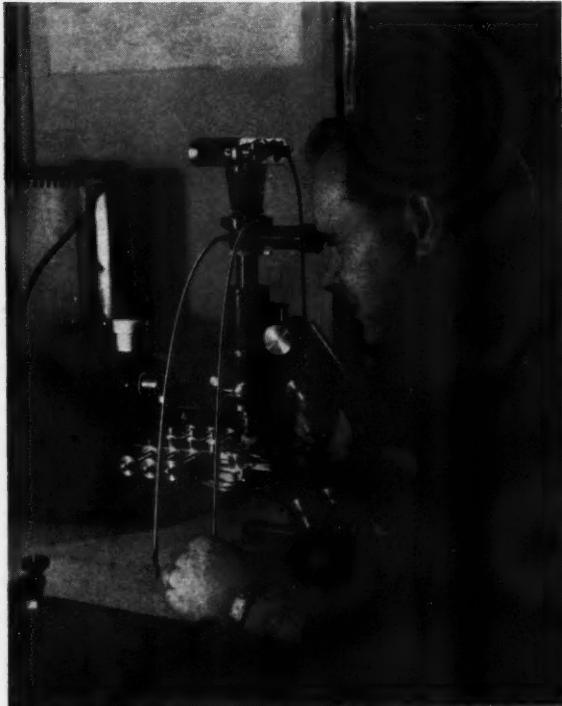
Bureau of Mines studies of controlling and preventing mine waste

dump fires showed that $\frac{1}{4}$ -in. by 0 preparation-plant sludges used as a covering layer for the dump piles effectively smothered fires in burning piles, and prevented spontaneous ignition of piles if maintained or protected from erosion.

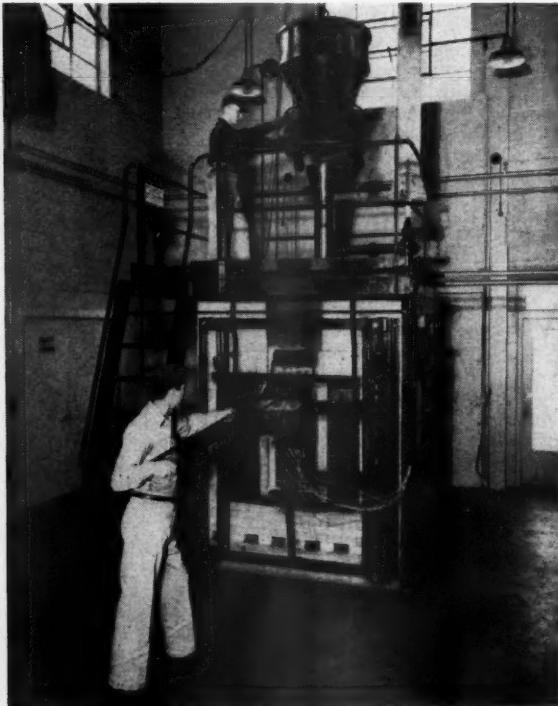
University of Washington research has been concerned with fundamentals of particle size behavior in heavy and medium suspensions. They recently reported on the performance of the heavy-medium process as it is affected by density of separation and operating conditions.

Virginia Polytechnic Institute continued its study into the factors affecting the efficiency of coal production and their investigation into coal mine roof and pillar action, and have investigated problems and methods in mining multiple seams.

West Virginia University conducted 20 coal research projects during 1954. Some of these have been under U. S. Bureau of Mines Fellowships. Projects on production and separation of coal included: cleanability of West Virginia coals, equipment and methods for suspension-type roof supports, emission of combustible gases and possible degasification of coal in advance of mining (sponsored with the Christopher Coal Co.), stresses in roof strata and coal pillars during mining, characteristics and variations in flow of methane into active coal mines, and the beneficiation of fine size bituminous coal for by-product and metallurgical uses.



Ohio Geological Survey is doing fundamental research on bituminous coal



Minature coke test oven at Eastern Gas & Fuel Associates at Everett, Mass.

Utilization As a Fuel

As would be expected, utilization of coal as a fuel received a major part of the research effort during 1954.

Babcock and Wilcox Co. continued its cyclone furnace development with studies on the reduction of ash discharged to the stack, remelting of fly ash, and improved combustion. They have investigated the use of low-grade fuels, ash handling, low temperature corrosion, and improved coal cleaning methods. Development work on coal pulverizers and their process applications is continuing.

The year saw the dedication of the first coal-research-association laboratory. Part of this laboratory's staff and facilities are being used to continuously improve the use of coal. Projects such as the development of package-type automatic steam generators for commercial and small industrial plants, use of stack sprays to reduce soot emission, development and testing of agricultural and residential equipment are being conducted in the Bituminous Coal Research, Inc., laboratory. The Locomotive Development Program of BCR recently completed 300 additional hours of operation in their latest series of tests with coal as the fuel for a locomotive-size gas turbine. The LDC reports that the 300-hr operation with bituminous coal as the only fuel resulted in complete freedom from turbine blade erosion from fly ash.

Fairmont Coal Bureau and other coal industry groups have been developing plant designs which reduce capital requirements in small industrial steam plants.

Illinois Geological Survey continued their research on stoker coal combustion and have related Gieseler fluidity to performance in domestic stokers.

Midwest Research Institute has been carrying out engineering and development work on coal as a fuel for sintering operations.

Norfolk and Western Railway Co. developed a coal-burning steam turbine electric locomotive and field tested it during 1954 with excellent results.

The Pennsylvania State University continued its research on industrial underfeed stokers and on residential comfort heating.

In the Bureau of Mines' program seeking expanded use of anthracite for metallurgical purposes, tests of anthracite were made in a foundry cupola, and methods of reducing breakage from thermal shock and attrition, and of reducing sulfur content of anthracite were studied.

Research on methods of improving boiler efficiency by lowering exit-gas temperatures showed the relative effectiveness of various alloys, special coatings, and ceramic products to resist corrosion. The effectiveness of certain amines in reducing corrosion in condensate return lines was demon-

strated. Refinements to the standard Ringleman charts for noting smoke density have been devised and tested in the field. Combustion tests on washery refuse material gave data for design of a semi-commercial pilot plant to produce lightweight aggregate.

Conversion

In addition to cooperating with the U. S. Bureau of Mines and Stanolind Oil and Gas Co. in an underground gasification study, Alabama Power Co. conducted low temperature carbonization research on coal.

The American Gas Association, in a major project, developed a pilot plant for the production of synthesis gas from coal.

Battelle Memorial Institute has engaged in carbonization, gasification,

Hydrocarbon Research, Inc., conducted gasification experiments on anthracite and silt and on bituminous coal.

The Institute of Gas Technology, affiliated with Illinois Institute of Technology, has directed its research to development of processes for making gas from natural gas condensates, petroleum, and coal. The Institute reports the development of a process for pressure gasification of coal in suspension without coke, tar, or by-products. This process involves the partial combustion of coal to synthesis gas, and the catalytic upgrading of the synthesis gas to methane. The Institute late in 1954 substituted a gas turbine for heat exchange equipment to reduce capital investment. They eliminate the boiler plant in the process and 13 percent of the coal.



BCR tested modern, coal-burning residential furnaces

and by-product chemicals research on coal.

Bituminous Coal Research, Inc., has continued its work on extending markets for fly ash and fine coal for non-fuel purposes. BCR's Fellowship at Mellon Institute has made a comprehensive study of the uses of coal in the chemical, metallurgical and other process industries.

Eastern Gas and Fuel Associates has developed an improved electrical-heated test coke oven for coke quality control. They have made movable wall oven tests and expansion tests to improve the utilization of various coals in producing domestic and metallurgical coke, and have made wet oxidation tests on coke produced from many different coal mixtures. Economic research studies have been completed on extending the use of coal, coke, gas, and coal chemicals. The effects of weathering of certain coals on quality of coke has been investigated.

Using the pressure and temperature of the gas leaving a reactor, they are able to meet all the power requirements for oxygen production, and oxygen and gas compression.

Iowa State College reports promising progress on converting bituminous shale into aggregate for road building material. This project has risen out of the fact that natural aggregates are becoming scarce in that state. They are currently investigating properties of materials adjacent to coal to develop uses for them.

Looking toward the day when their production will be economically justified, Koppers is sponsoring a continuing program of research and development in the production of synthetic liquid fuels and coal chemicals derived from their production.

Koppers designed and constructed the semi-commercial gasification plant of the United States Bureau of Mines at Louisiana, Mo. This was the first successful installation of its

type in the Western Hemisphere. This process has received added stimulus by the construction of a successful plant of the same type in Finland to provide the basic gases necessary for the manufacture of ammonia. Successful operation of this plant has inspired the projection of similar installations in other parts of the world. Further research is being carried on in this field by the operation, at the Koppers Verona, Pa., Research Center, of two pilot plants, not only for the total gasification of coal, but also for the hydrogenation of coal to produce synthetic oil.

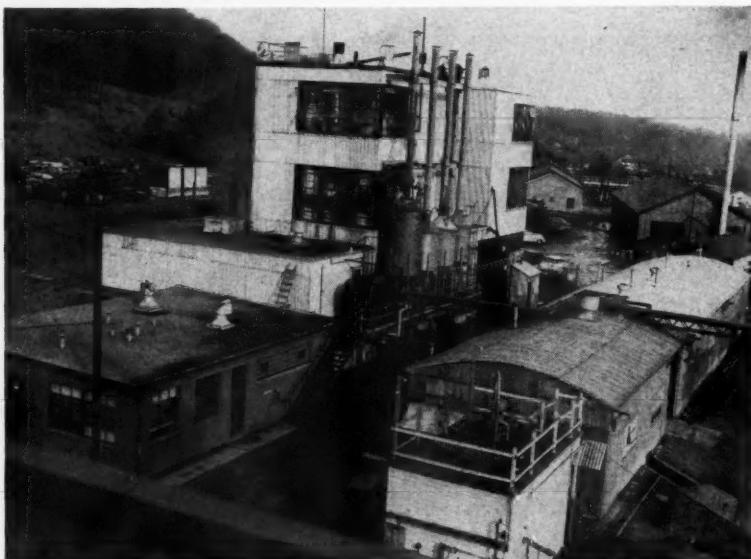
Arthur D. Little, Inc., conducted research on special aspects of coking.

Coal as a source of germanium, an item of intense interest in 1953, received attention in 1954 at Midwest

Pittsburgh Seam coal. This project has taken up Consol's major attention during 1954 and was demonstrated on a 50-tpd pilot unit at Library. Various coals from the Pittsburgh Seam and other areas of the U. S. have been processed.

A major amount of Consol's laboratory manpower has been concerned with the refining of low temperature tar including processing of acids, middle oil fractions and pitch. All these developments have been carried through laboratory and pilot scale operations.

In addition, their activities have included exploratory studies in the laboratory on the kinetics of gasification, catalysts, coal composition, plasticity, etc. An example of this type of work is the development of a new type of



Pittsburgh Consolidation Coal Co. research center at Library, Pa., includes fluidized, low temperature carbonization pilot plant

Research Institute. Midwest also investigated coal under selected conditions for the production of aromatics; while Northwestern University conducted low temperature carbon research on bituminous coal and lignite.

Pennsylvania State University experimented with the gasification of anthracite and did fundamental research in carbon dioxide-carbon reactions and methane formation.

The University of Pennsylvania has made several fundamental studies on coal conversion, one of which is the extraction of tar acids.

Major recent accomplishments of the Pittsburgh Consolidation Coal Co. Research and Development Division include the fluidized gasification of coal, oxygen, and steam through pilot plant scale. This project was carried on jointly with the Standard Oil Development Co.

Another major development now nearing completion is the fluidized low temperature carbonization of

fuel cell to operate on coal in order to lower the cost of electric power. Another recent addition to their research has been the establishment of a coke testing laboratory where coals will be explored for their coking properties by themselves, and in blends with other coals and chars to assist the consumers in the proper utilization of metallurgical coal reserves.

Another company interested in gasification and carbonization research was Sinclair Coal Co., who also did development work in making lightweight aggregate from coal shale.

Southern Research Institute has also made fundamental studies on coal as a raw material for chemical synthesis and has carried out low temperature carbonization of Alabama coals in a fluidized bed.

Distillate properties of Utah coals carbonized at different temperatures have been investigated by the University of Utah.

The U. S. Bureau of Mines studied

various factors in coke oven operation to obtain a better concept of the mechanism and kinetics of carbonization. These included studies of the relation between fluidity during carbonization to coke strength, and the effect of addition of inert on the expanding properties of coking coals. Special chars were prepared for testing as to their suitability as substitutes for low-volatile coals in carbonizing blends.

A prototype fluidized-bed low-temperature lignite carbonizer of about 35 tph capacity was designed from U. S. Bureau of Mines pilot-plant data, constructed and tested at the Aluminum Co. of America plant at Rockdale, Tex., to carbonize lignite from the fluidized dryers to produce char for the power plant and pitches, tars and coal chemicals. The pilot dryer-carbonizer plant at Denver was used to determine low-temperature carbonizing properties and yields from a wide variety of materials, including saw dust, lignites and non-agglomerating bituminous coals, and oil shale.

The Bureau's extensive collection of data was reviewed to determine possible correlation between plasticity and petrographic and chemical analyses of coals, but no significant relationship was found. A study of edge effects in the sole-flue expansion oven indicated they did not seriously influence test results. An interesting correlation was noted between commercial and test oven data on bulk density and expansion properties of coking coals.

Bureau of Mines gasification tests of anthracite were made in an atmospheric gasifier to determine design data, slag removal characteristics, and gas costs. Study of the effect of vortex flow of an entrained gasification of powdered bituminous coal gave relationships between feed rate, carbon conversion, and kind and amount of gases produced. Effects of variations in methods of preparing catalysts for methanation of synthesis gas to high Btu gas indicated ways of improving effectiveness and service life of the catalysts.

To determine the gasification characteristics of American lignites with oxygen and steam, a bench-scale gasifier was erected, and tests were made to determine optimum moisture content of the lignites in the gasifier.

The Bureau of Mines study of gasification at atmospheric pressure was terminated. Results of this work are being used in a commercial installation being built by private industry. Current projects include gasification at elevated pressures, purification of synthesis gas (particularly as concerns dust, carbon dioxide, and sulfur compounds), and transportation of finely divided coal. A new experiment station at Morgantown, W. Va., houses the gasification branch.

Bench-scale work is continuing at the Bureau on the kinetics of liquid-phase hydrogenation of coal in the presence of various catalysts and on a one-step hydrogenation process at temperatures above those used in conventional coal hydrogenation. This process is also being tried in a pilot plant. Control of the highly exothermic process has proved to be quite difficult, but a few extended runs have now been made.

Engineering developments of the Fischer-Tropsch process with a fixed oil-submerged bed of iron catalyst are about to be finished with testing of nitrided lathe turnings. Development of the catalyst-oil slurry process continues in a modified pilot plant that permits circulation of slurry concurrently with or countercurrently to flow of synthesis gas. Studies of kinetics and mechanism of the synthesis and research on preparation of new catalysts are in progress; they include bench-scale work on the role of alkali as a promoter of iron, preparation of organometallic compounds presumably similar to the transitory surface complexes formed during synthesis, development of methods for preparing iron boride suitable as a catalyst, and investigation of the effect of steam and carbon dioxide—by-products of synthesis—on catalyst as well as products.

West Virginia University has collected extensive fundamental data on physical tests of coal blends for the production of metallurgical coke and has continued their research with the U. S. Bureau of Mines on purification of synthesis gas by absorption.

The University of Wyoming has investigated subbituminous coal to discover yields obtainable by fractional carbonization. They have also tested Wyoming coals for possible processing into activated carbon.

Australia

Several government groups, private companies, and universities in Australia are active in coal research. Coal Research Pty., Ltd. of Australia, whose counterparts would be the British Coal Utilization Research Association in England and Bituminous Coal Research, Inc., was set up with research on coal production and utilization as a major part of its responsibility. Its research covers coal seam moisture, dust control during mining, coal cleaning and sizing, shot-firing methods, ventilation underground, and handling and disposal of mine water.

The State of Victoria has great reserves of brown coal which are being developed as a source of electricity and gas. Western Australia is attempting to produce coke from low-grade bituminous coals, and in South Australia such coals are being developed for power generation and industrial use.

The University of Sydney reports that they have produced quality coke from non-coking coals. They report, also, that as a result of their coking and gas-making studies an acceptable metallurgical coke has been made from high-sulfur coal. They feel that the yields of gas and coke in large scale vertical retorts can be predicted by laboratory equipment as a result of their correlation studies in this field. The University is investigating the occurrence of trace elements in coal, and are attempting to clarify the sequence and character of natural changes in coal properties during advancement in rank from brown coal to anthracite.

Canada

Several studies on coal properties are under way by the Fuels Division, Mines Branch of the Department of



The Pennsylvania State University determined surface area of a coal by gas adsorption technique

Mines and Technical Surveys. These include a physical and chemical survey of Canadian coals, the capacity absorption of gas by bituminous coal, occurrence of germanium in coal and coal tar, as well as a study of methods of coal analysis.

The Canadian Institute of Mining and Metallurgy is studying the degasification of coal strata and the application of millisecond blasting in coal mines. They issued two reports on roof bolting during 1954. The Fuels Division of the Department of Mines and Technical Surveys is studying strata stress in coal. The Department of Mines of Nova Scotia is also active in studies related to mining. Through diamond drilling, they are testing possible extensions of coal seams in Nova Scotia and are attempting to work out fault structures in the Pictou County coal field in Nova Scotia.

Studies affecting the use of coal as

a fuel are being carried out by the Fuels Division of the Department of Mines and Technical Surveys. They are studying preparation of briquettes for stokers, briquetting of coal and coke blends, improving use of coal for power generation, and development of coal-fired gas turbines. Nova Scotia Technical College, with the Nova Scotia Research Foundation, is developing domestic furnaces. The Nova Scotia Research Foundation itself is testing on Canadian coals a residential space heater developed by Bituminous Coal Research, Inc.

The Department of Mines of Nova Scotia is conducting low temperature carbonization research on Nova Scotia bituminous coals.

England

As a result of several years' study of coal grindability, the British Coal Utilization Research Association (BCURA) have advised that their test results suggest that a simple relationship exists between the power consumption of the grinding mill and the amount and fineness of the pulverized fuel. They have found that this relationship exists with both very soft and very hard coals. They are currently investigating the middle range of hardness. BCURA is continuing its study of the chemical constitution of coal. Also active in research on coal properties is the British Government Department of Scientific and Industrial Research (DSIR). One of the studies of DSIR is on changes in chemical structure which take place in the coal substance during maturing. They have found that there is a progressive development of aromatic and/or hydro-aromatic structures of comparatively simple types until the coal has reached a carbon content of approximately 90 percent. They have found that further maturing results in the progressive condensation of these structures to give fused-ring units of increasing complexity.

The University of Leeds is investigating dimensional changes in coal in the temperature range of minus 190° C. to plus 190° C. and the deformation of coal under unidirectional compressive strength between 0° C. to plus 150° C. The University of Sheffield is making infra-red spectroscopy measurements on coal extracts to discover the part which chemical structure plays in coking.

The National Coal Board is active in research on production and preparation. They are studying coal cutting methods and equipment, strata control, belt conveyors, hydraulic transport, tunnel and roadway construction, and underground communications.

In improving the use of coal as a fuel, Allied Ironfounders, Ltd. is conducting research to improve the performance of coal-fired cooking and

heating stoves and improving the fuel efficiency of the open fireplace, which is widely used throughout England.

BCURA is continuing the development of a slagging cyclone combustor for burning fine, but not pulverized, high-ash coal for coal-fired gas turbines. Gas cleaning is a part of this project. They are investigating the effect of fuel characteristics on boiler design and are developing two experimental methods to determine the relative importance of physical factors and chemical factors on the release of volatile matter in fuel beds during lighting-up and recharging periods. They are attempting to devise a technique for establishing a smoking index of coals. They are also investigating the composition and formation of boiler deposits.

relative motion of air to carbon, the University of Sheffield is studying the reaction as one in the gaseous phase, in that there is no relative motion between soot and air. In their study of the combustion of individual particles of pulverized coal to aid boiler designers, they are developing a combustion pot technique to determine the minimum rate at which coke will remain lighted in fuel beds of various sizes with various degrees of wall cooling. They are also investigating the relationship between soot formation and the luminosity of flame of the volatile of a coal bed.

The English are carrying on extensive research toward converting coal to other forms of fuel. The British Coal Utilization Research Association is conducting research on pelletizing

suitable catalysts and with conditions required for the synthesis, but also of the chemical engineering problems associated with the operation of the process on an industrial scale.

The University of Leeds is carrying on a laboratory scale investigation of a method of completely gasifying coking coals in one stage in a fluidized bed. They are also investigating the phenomena of the complete gasification of coal in a fluidized bed and are conducting a laboratory investigation of a method for single stage production of synthesis gas from pulverized coal.

France

Charbonnages de France, which carries on research activity for the French coal industry, reports research in coal production, preparation, combustion, coking, and gasification. In the production phases they are studying the behavior of roof supports when subjected to very slow or very rapid loading. In measuring the movement of shaft walls and supported overburden, it has been possible to formulate simple laws based on behavior in a large number of different mining operations.

In the interest of mine safety, the French have studied the liberation of firedamp during one volley of explosives. In addition, they have developed a portable firedamp detector which is now being fabricated in large numbers for extensive trials. They are also experimenting in the laboratory with a recording-type firedamp meter which will automatically switch off electrical installations at specified firedamp concentrations.

Principal effort in coal preparation is on the treatment of slurries, either by flotation or by centrifuging after adding oil. Methods of controlling washeries to improve performance are being worked on continuously. Agglomeration studies are being carried out on briquet quality and on briquet binders.

In coal utilization, the principal objective of the French is in perfecting heating appliances for a wide range of bituminous coal.

The French have been experimenting with underground gasification during 1954. They expect to continue this work next year. During 1954 they reported important progress in control of the operation and uniformity of gas quality, but, as in other underground gasification projects, they find that the average calorific value of the gas remains low.

In their laboratory-scale coking studies, the French have been analyzing the phenomena accompanying the resolidification of coking coal. They are now concentrating on the phenomena accompanying fusion to determine the factors which affect the cohesion of the coke. They are study-

(Continued on page 114)



Nova Scotia Department of Mines was one of the groups studying low temperature carbonization of coal

Because pulverized-coal firing is being used increasingly in electric generating stations in Britain, DSIR is giving more attention to this type of firing. As a result of this research, a new type of boiler deposit has been discovered and assumptions have been made concerning its formation. The Fuel Research Station is continuing its study of a process for the recovery of sulfur from flue gas. They are continuing experimental work on various types of combustion chambers for coal-fired industrial gas turbines and are studying the formation of smoke from industrial boiler furnaces.

The University of Leeds is also conducting combustion studies on factors affecting smoke production and on the combustion mechanism of burning fine particles of coal.

The University of Sheffield is using a new approach to determine the rate of combustion of soot relative to excess air concentration in the furnace atmosphere. Where previous investigators have used systems involving

and gasifying slurry and low-grade fines, and is studying the effect of fuel distribution on gas producer performance with promising results. The British Government Department of Scientific and Industrial Research is experimenting with the carbonization of high volatile, weakly-caking, or medium-caking coals, to produce reactive coke suitable for use in domestic grates. Its research is continuing on methods of generating industrial fuel gases from weakly-caking coals and low-grade fuels such as coke breeze.

As a result of pilot scale studies of generating water gas from low-rank coals and peat in fluidized beds, a method of correlating rates of gasification in different sizes of plant under a wide range of reaction conditions has been found by DSIR. Its work on the Fischer-Tropsch synthesis process, by means of which liquid fuels and chemical products may be obtained from coal, includes the study, not only of purely chemical problems concerned with the development of



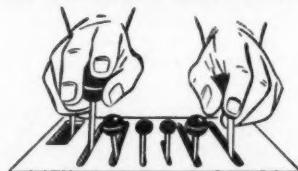
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Aggregates head the list both in brute volume and dollar value

Industrial Minerals in 1954

Complete Report on Fast Growing Field Shows
Banner Year for Some; Bright Future for All

By J. L. GILLSON

Development Dept.
E. I. du Pont de Nemours & Co., Inc.

PREPARATION of this annual review of developments and activities in the Industrial Mineral field has become a most stimulating experience, because of the steady onward "drive" toward more and better products and easier and cheaper ways of doing things that are demonstrated annually by the producers of such mundane things as gravel, diatomaceous earth, and gypsum. *Fortune Magazine*, writing on "Raising Productivity" in its January 1955 issue, explains that "at bottom was the enormous energy of the American — restless, intense, unsatisfied, headlong." Industrial Mineral men are typical Americans. Canadians are right along with them.

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the gross bulk of accomplishment. These industries contributed to the \$37 billion of new construction in the United States in 1954, of which \$13.3 billion was for building 1,200,000 new homes, \$2 billion was for schools, and \$4.4 billion for public utilities.

P. W. Litchfield, chairman of the board, the Goodyear Tire and Rubber Co., wrote in the *Mines Magazine* for January that the cost of not having adequate highways actually is proving to be more staggering than the cost of having them, and at last the country has rolled up its collective sleeves and is providing them. Three long expressways were finished, or almost finished, in 1954: in West Virginia, New Jersey (Garden State), and the New York Thruway. Ohio opened one short section of its northern expressway, and Indiana had all of its under contract and expects to open it simultaneously with that of its eastern neighbor. Twenty-four states and the Province of Ontario have expressways in various stages of planning and construction.¹ President Eisenhower has announced a "grand plan" for

spending an additional \$50 billion on road construction during the next ten years, and now that the states have submitted their estimates of needs, the total comes to \$101 billion! In addition to the more publicized expressways, all states have kept plugging along on routine improvements like the Bayshore Freeway around San Francisco, and the Columbia River Gorge highway and heavily traveled U. S. 29 in North Carolina. In high appropriations not counting those for toll roads, California leads with \$146 million under contract in 1954, followed by Pennsylvania, \$135 million; New York, \$131 million; Texas, \$130 million, and Ohio, \$120 million. Every city in the country was busy reaming out bottlenecks, or is planning major undertakings, the most spectacular of which are Boston's Central Artery, Chicago's Skyway and Congress Street Expressway, a bridge and tunnel for Hampton Roads, \$130,000,000 for a tunnel under the harbor in Baltimore, the Battery Street Subway in Seattle, the Major Deegan Expressway in New York, the Schuylkill Expressway in Philadelphia, and major projects in Winston-Salem, Houston, Trenton, Detroit, and Los Angeles.

Nineteen hundred fifty-four was not an outstanding year for new dam construction, but several big ones are in the "talk" stage. Two major ones were dedicated, Texarkana and Chief Joseph (to be completed in 1955), and work is under way at many: Webster Dam on the Solomon in Kansas; the Tiber Dam on the Marias River in Montana; the Missouri Diversion Dam

AGGREGATES—Aggregates are always at the head of the list, not only in brute volume, but also in dollar value, since with lime and cement with which they are principally used, their sales constitute over 75 per cent of the gross of all industrial minerals. The story of achievement of these producers is not recorded by the opening of a new gravel pit nor the installation of a new scrubber, but rather in

¹ See *Engineering News Record*, December 30, 1954, pp. 58-9.

below Fort Peck; Gavins Point, Fort Randall, Garrison, and Oahe, also on the Missouri; St. Anthony on the Upper Mississippi; Blakely Mountain on the Ouachita in Arkansas; Roanoke Rapids in Virginia; Buford on the Chattahoochee; Demopolis on the Tombigbee; Jim Wodruff on the Appalachicola; Old Hickory and Cheatham on the Cumberland; a series of dams on the Raquette River in New York; one on the Housatonic in Connecticut; First Fork in Pennsylvania; and Cheery Valley, Folsom and Nimbus on the Sacramento, all in California.

Dams authorized for which the planning is well advanced are: Glendo in Wyoming; Priest Rapids on the Columbia; Mayfield on the Cowlitz in Washington; Cougar, Green Peter and White Bridge in Oregon; Wan ship in Utah; the Cuyama in California; New York's \$140,000,000 Cannonsville; Noxon Rapids on the Clark Fork; the \$263,000,000 Libby Dam on the Koote nay; and the Kaiser Aluminum Company's dam, also on the Columbia. Three large projects are still tied up in arguments: Tuttle Creek in Kansas; the Echo Park Dam on the upper Colorado; and Hells Canyon on the Snake. The large Frying Pan mountain diversion project in Colorado has budget approval but no authorization.

A number of major bridges are under construction, one across the Hudson for the New York Thruway, two across the Delaware (one for the Pennsylvania Turnpike and another at Philadelphia), the world's longest bridge across Lake Pontchartrain, the Richmond-San Rafael Bridge across San Francisco Bay, a new Mississippi River Bridge at New Orleans, a high level bridge at Buffalo, a big concrete span over the Klickitat River in Washington, the Surfside Bridge over the Brazos in Texas, the Mackinac Straits Bridge in Michigan, and the Pend Oreille River bridge in Idaho.

Airfields are big users of aggregates. The Air Force has projects under way totalling about \$1 billion. In the November elections, bond issues for a billion dollars were approved around the country for schools, hospitals, streets, sewage plants, etc.

Not only was it a year of major construction, but bigger ideas for the future were under consideration. The St. Lawrence Seaway was approved, with all of its implications of additional collateral construction for roads, wharves, etc. A project to dwarf even the Kitimat development in British Columbia was proposed by Northwest Power Industries, Ltd., to develop 880,000 horsepower on the Yukon and Taku Rivers, on the boundary between the Yukon and British Columbia and close to the Alaskan border, thus providing power for \$57,000,000 in smelters and refineries. Even Paul Bunyan would not scoff at the plans in California for the Feather

River project to bring plenty of water to central and southern California, for which the proponents are expecting approval by 1960.

It is thus obvious that the producers of aggregate had plenty to do in 1954, and that they will not be idle during the next decade.

A few outstanding developments within the industry may be mentioned. The Pioneer Sand and Gravel Co. of Seattle installed the largest scraper bucket in use in the industry within the country at its Steilacoom operation. The use of heavy media separation to remove soft sandstone and chert from gravel was extended to another plant during the year, this one in Michigan. Several attrition machines have been installed to scour sand, and much work has been done in recovering fines when washing sands. This development employs liquid cyclones. Another interesting development is the use of heated screens to prevent blinding. Froth flotation has been adapted to plants producing glass sands, but not for sands for building purposes.

Figures released by *Pit and Quarry Magazine* state that sand and gravel production reached 468,000,000 tons, vs. 454,000,000 in 1953. Crushed stone output increased one percent to 310,000,000 tons. The average selling price for both sand and gravel remained static. Sand increased one cent to \$1.02 per ton and gravel two cents to \$1.33. These are country-wide averages. In the West prices are \$1.43 and \$1.56, respectively. The average hourly wage paid in sand and gravel plants increased from \$1.51 to \$1.58. Wages around the country were: South \$1.18; Midwest \$1.56; East \$1.60; and West \$2.07. The average selling price for crushed stone advanced from \$1.42 to \$1.44. Wages paid were \$1.49.

There are 3001 sand and gravel plants and 1683 crushed stone plants.

ABRASIVES—The Idaho Garnet Abrasive Co. started dredging gravels in Emerald Creek at Fernwood in Benewah County to recover garnets which are concentrated by jigging, and then crushed. The Carborundum Co. has developed a fused alumina abrasive, called "Highway Safety Grain," to impregnate highway surfaces to make them skid resistant. Most of the rest of current news on abrasives was from foreign sources. Canadian abrasive resources were reviewed this year by the Industrial Minerals Division of the Mines Branch. An item of especial interest is that 100,000 tons of silica sand are consumed annually in the manufacture of artificial abrasives, principally silicon carbide, at Shawinigan Falls, Quebec, on which the United States depends almost entirely for its supplies. The principal source of the sand is at St. Canut, Two Mountains County, Quebec.

An important deposit of crystalline corundum was discovered in Mozambique, in the Revue River area, in the Government Inchope tin reserve.

ALUNITE—An effort to revive the production of alunite from Marysville, Utah, is being made by a company which calls itself Calunite Corp. A mill to process the ore, said to cost \$175,000, has been built. The alunite will be used as a fertilizer.

ANORTHOSITE—A prosaic use for the \$4,500,000 experimental alumina plant which was built at Laramie, Wyo., during World War II by the Federal Government was announced by the Ideal Cement Co. of Denver. The plant will be used to make aggregate out of the anorthosite.

ASBESTOS—There has been aggressive activity in the asbestos industry around the world. World production of all grades is estimated at 1,600,000 tons, valued at \$250,000,000. In Quebec, 938,000 tons of fiber were produced by seven companies working eleven mines. These companies are the Asbestos Corp., Ltd.; Bell Asbestos Mines, Ltd.; Canadian Johns-Manville Co., Ltd.; Flintkote Mines, Ltd.; Johnson's Co., Ltd.; Nicolet Asbestos Mines, Ltd.; and Quebec Asbestos Corp., Ltd. In addition, United Asbestos Corp. or Lake Asbestos of Quebec, Ltd., a subsidiary of American Smelting and Refining Co., is preparing to spend \$20,000,000 on a project to drain Black Lake, and start production on a basis of 4000 tons daily. The mill of the Continental Asbestos Co. in Thetford is being used as a pilot plant for processing ore from Lake Asbestos. The Quebec government has given its authority for the draining of the lake to expose a reserve stated to be 60,000,000 to 74,000,000 tons. Canadian Johns-Manville opened the first unit of its new 14-story building to mill ore from the Jeffrey Mine which produces one-third of the supply of fibre to the Free World. When completed in 1956 the mill will treat 625,000 tons annually. Company management states that there is a 100-yr reserve available. Operation at the mine is being switched from open pit to underground, and now only 28 percent is coming from the surface quarry. No. 2 Shaft was bottomed at 1440 ft. The operation was described in the *Canadian Mining Journal* for October 1954.

Johnson's Asbestos Co. opened its new plant which has cost \$8,500,000, at the Megantic Mine at Thetford. The mill has a rated capacity of 4000 tpd. The Asbestos Corp. has been building a new mill at Normandie, near the Viny Ridge Mine, which should be in operation early in 1955.

The mill will have a capacity of 5000 tpd. Reserves of Asbestos Corp. are over 104,000,000 tons.

Quebec Asbestos Corp. has discovered a new orebody 15 miles northeast of Thetford Mines, with a reserve estimated at 40,000,000 tons of rock carrying commercial fibre. A plant with a capacity of 2000 tpd is being designed by General Engineering Co. Derogan Asbestos Corp. has commenced to diamond drill a property in Melbourne Township, under which asbestos veins have been found on the surface.

In Ontario, Canadian Johns-Manville is digging a shaft to be 800 ft deep at its Munro mine, 10 miles east of Matheson, to prepare for underground production to start in 1958. A report on asbestos in Ontario, written by D. F. Hewitt and J. Satterly, was issued by the Ontario Department of Mines during the year.

In British Columbia, 45 miles south of the Yukon border, Cassier Asbestos Corp., Ltd., is undeterred by its isolation and rigors of mountains and climate, and is developing a mine called the Cirque, on McDame Mountain, in addition to what is called the Main Deposit. An aerial tram has been built to handle rock from mine to mill, which has a daily capacity of 500 tons. Ore reserves are in excess of 7,000,000 tons. The ore body lies within the zone of permafrost, a feature which actually has been helpful, since the fibre breaks away from the rock more readily than in normal ground. A daily production of 60 tons of marketable fiber grades 3K and 4K are produced, which are trucked to Whitehorse, shipped by rail to Skagway, and by boat to Vancouver. A road 300 miles long to Stewart, Alaska, is planned.

In Labrador a crocidolite deposit was discovered in the Iron Mountain district.

In the United States, the Rubaroid Company has built a modern mill at its property near Lowell, Vt., on Belvidere Mountain. The mill has a capacity of 125 tph, and turns out about 50,000 tons per year of short fibre of non-spinning grades. This is almost the entire U. S. production of short fibre asbestos. In Arizona further search for iron-free, long-fibre asbestos is being stimulated by grants from the Defense Minerals Exploration Administration.

In Alaska, Asbestos Corp. (Exploration), Ltd., has an option to purchase 27 claims on Ibex Mountain, Hyder Recording Precinct, where high grade chrysotile asbestos has been found. In Oregon, Johns-Manville is diamond drilling some claims in Joseph County.

In Newfoundland, Newfoundland Asbestos, Ltd., another company belonging to Walter E. Seibert, owner of St. Lawrence Fluorspar Co., is developing

a deposit near Port au Port Bay and is planning a mill of 100 tpd capacity.

In Europe, a new mine at Rujiste in Siberia was expected to begin operations in 1954. In Southern Rhodesia, Johns-Manville opened a new central mill at Mashaba, with an initial capacity of 20,000 tons of fibre annually. The rock comes from two mines, one, the Temeraire, is close to the mill, the other, the Shamala, is four miles away. Each mine has a shaft 550 ft deep. Processed fiber is trucked to a railroad at Fort Victoria, from where it is shipped by rail to Beira, Mozambique. Also in Southern Rhodesia, Canadian Overseas Asbestos Corp. has bought an asbestos mine in the Belingwa area and has appropriated \$3,000,000 to develop an operation on a scale of 15,000 tons of finished fibre annually. In Mozambique, close to the Southern Rhodesia border, a discovery of amphibole asbestos has been made at Mavita.

BARITE—Highlights among the new developments in the barite industry in the past year have been the increased importation of foreign ore, further expansion of domestic processing facilities and the development of more economical methods in the transportation of finished product in bulk to offshore oil well drilling sites.

Barite sold or used by domestic producers, exclusive of imported material, was 944,000 short tons in 1953. From all indications, 1954 production will be about the same. World production of barite is currently in the order of 2,100,000 tons, on an upward trend. The United States consumes about 54 percent of world production.

The oil well drilling industry currently consumes about three-fourths of the domestic plant output. About one-half of the demand by this industry is localized in the Gulf Coast area, with the balance fairly well spread over the central part of the United States and some further concentration in the southern part of California.

Arkansas still leads in domestic output and is followed closely by Missouri and Nevada. Georgia, Arizona, Montana, Tennessee, South Carolina, and New Mexico are responsible for most of the remainder.

Magnet Cove Barium Corp. has developed a deposit called the Greystone, 42 miles south from Beowawe, Nevada (a station on the Western Pacific, 60 miles west of Elko). The deposit is said to be very large, 1000 ft wide and 3000 ft long. A grinding plant is planned. Another mine in the same area is called the Mound Springs Mine, operated by Barium Products, Ltd., a subsidiary of Food Machinery Corp. About 600 tons of crude barite are shipped each week to the company's plant at Modesto, Calif. The Simplot Co. of Boise, Idaho, has resumed operations at an open pit mine near the

head of Deer Creek in Blaine County, Idaho.

Seven dry grinding plants on the Texas-Louisiana Gulf Coast, five of which have been built within the past three years, continue to supply a large portion of the Gulf Coast oil well drilling market. Most of the crude ore for these plants is imported from foreign sources.

The importation of crude barite ore into the United States has increased from 52,755 short tons in 1951 to 334,788 short tons in 1953. It is anticipated that the curve will level off. More than half of the imported material has been derived from Nova Scotia; Yugoslavia and Mexico are next in importance.

Operations at Walton, Nova Scotia, by the company now called Barymin Co., are continuing on a very large scale, and as a result of a diamond drilling program, reserves have been doubled. The 1953 production was 248,973 tons.

The amount of ground barite imported into the United States is insignificant. Since 1951, the import tariff has remained at \$3 per long ton on crude and \$6.50 per long ton on ground material.

An interesting new development which might lead to a large scale application has been reported by Rubarite, Inc., owned jointly by Goodyear Tire and Rubber Co., National Lead, and Bird & Sons, Inc. A free-flowing powder, consisting of unvulcanized synthetic rubber and ground barite, will be used in road construction. The barite serves as a carrying agent for the rubber particles, permitting ready dispersion in asphalt.

Increased shipments of bulk ground product are being made by covered hopper railroad cars and by specially designed trucks in which it is transported direct to the well site. A recent innovation in the transportation of finished product to offshore drilling sites is the use of portable metal containers, or hoppers, of two to three-ton capacity which has eliminated part of the excessive handling cost in these operations.

A discovery of witherite in Northern British Columbia, near Lower Laird Crossing on the Alaska highway, has been reported. The ore consists of 50 percent fluorspar, 35 percent witherite, and 7 percent barite, with a gangue of quartz. The owner of the deposit is Conwest Exploration Co.

Barium titanate is discussed under the heading of ceramics.

BERYL—The demand for beryl has not increased as rapidly as had been expected a few years ago. The 1953 supply was 9000 tons, the demand 2662 tons. Key Chemical Co. has erected a beryl processing plant at Orreville, S. D. Quebec Beryllium,

Ltd., is exploring an area in Figuerie township, near Val d'Or, Quebec. A mill, rated at 100 tpd capacity, is being erected.

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CERAMICS—Except for the fact that ceramic products are produced principally from industrial minerals, this very highly technical subject hardly belongs in this review, and in a limited space justice cannot be done to it. Only a few outstanding developments can be mentioned.

Armour Research Foundation has announced flexible ceramic coatings called "solution ceramics" because they are applied from chemical solutions. The coatings are refractory metal oxides, certain phosphates, silicates, fluosilicates, oxyhalides, etc. The coatings are not brittle and can be applied to any clean surface at a moderate temperature. A patent position has been established. The object to be coated is heated in the range 200° to 700° F, and the solution is sprayed on. The solvent flashes off, leaving a ceramic film molecularly bonded to the surface.

Robinson Brick and Tile Co. has announced a ceramic veneer, $\frac{1}{8}$ in. thick, claimed to be harder than glass or steel, weighs four lb to the square foot, and comes in sheets 16 by 24 in. Ferro Corp. has a ceramic glazed concrete block made with a glaze that can be applied without impairing the structural strength and at reasonable cost. The coating can be in various colors, mottled or stippled, as well as plain. Ceramic coatings on all exposed steel parts is the goal of the Bettinger Co. Ryan Aeronautical Co. has announced a flame spraying technique to apply heat resistant ceramic coatings to various metals. Life of coated exhaust systems withstanding tempera-

tures of 2200° F is three to five times longer than uncoated metals.

Out of Oak Ridge comes the news that heat resistant ceramics of hafnium oxide can withstand temperatures of 1700° C, whereas zirconium oxide deteriorated at 1000°. More will be said of these products under the heading refractories.

A ceramic block for jet plane runways is being tested by the Navy at Wilmington, N. C. The blocks are 8 by 8 by 4 in. and are spaced three-quarters of an inch apart in each direction, and in these joints reinforcing bars are placed. The blocks are laid in the "warm-up" area on the runway.

Considerable research has been done to explain variations in texture and physical properties of talc used in the ceramic industry. This work was done on the basis of phase, field, and atomic structure considerations with the aid of chemical, X-ray, and differential thermal analyses.

Published data on the thermal conductivity of minerals at different temperatures are very unreliable because methods of measurement were not accurate. Considerable progress has been made to develop new and more accurate methods and this property has again been determined for many of the minerals commonly used in ceramics.

Improvements have been made in TiC base Cermets for use in airplane power plants by Accountius and Greenhouse.

Aluminum titanate ceramic bodies were found to have better resistance to thermal shock than alumina, beryllia, zircon or cordierite ceramic bodies. Aluminum titanate was found to have a thermal expansion about the same as that of fused quartz.

In the field of ferrites, certain compositions have been developed which

show square hysteresis loops of permeability. Such materials are desirable for "memory" cells of digital computers and are used for this purpose. A disadvantage of barium titanate ceramics has been their tendency to age with time. This objectionable characteristic has been overcome by making a cubic form of barium titanate in place of the tetragonal form. High voltage transformers made of glass with silicones may be used up to 350° C and are unaffected by high humidity. A new method of bonding ceramics to metals has been developed using a silver solder with a titanium core. When used under a vacuum this type of solder will wet both the metal and the ceramic and bond them tightly.

Tin oxide base ceramic bodies were developed with high strength, superior resistance to thermal shock and high thermal conductivity.

The discovery of moisture expansion of ceramic bodies in 1928 and its control by adding certain minerals like talc to such bodies has done considerable to overcome delayed crazing on glazed terra cotta, wall tile, and semivitreous dinner ware. This year it has also been discovered that moisture expansion of structural clay tile is also a major cause of masonry cracking and its control will undoubtedly do considerable to prevent this type of structural failure in future buildings.

The titanate ceramic body which is a development of the past decade has assumed major importance. Titanates are compounds formed from Group II elements which have been reacted with titania. In addition lead, not a Group II element, is used and zirconates are common additives. Barium titanate is the one most widely used. The most outstanding features are relatively high dielectric constants. By comparison with most ceramic insulating bodies which have dielectric constants in the neighborhood of 4 to 8, titanates have been formulated with "K" values in excess of 10,000. Thus these unique materials permit the fabrication of extremely small capacitors. Titanates can be polarized, thus become piezoelectric, which gives them the ability to translate mechanical energy into electrical and vice versa.

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CLAY—Brooke L. Gunsallus, commodity expert of the U. S. Bureau of Mines, has kindly supplied the following information on the clay industry:

The use of clay in general increased five to eight percent in 1954 over 1953 because of the record level of construction attained. The impact was especially obvious in brick and tile clays, and fire clays. Fullers earth, bentonite, ball clay, and kaolin production was about the same in 1954 as in 1953.

A vibrating press with a vibrating



Arkansas still leads in domestic output of Barite

cycle approaching the ultrasonic range for use in brick and hollow tile was discussed in the *Brick and Clay Record*. Additives to reduce the firing cycle in brick were much in the news.

The old Attapulgus Clay Co. acquired the outstanding stock in Porcel Corp., and then merged with the Edgar Brothers to become the Minerals and Chemical Corp. of America, with assets of \$100,000,000. Porcel makes activated bauxite for use as a deodorizer and decolorant.

COLUMBITE AND TANTALITE— These minerals have always been considered as Industrial Minerals, although now their principal uses, along with euxenite and pyrochlor, are as ores of the metals. Developments concerning them have been very numerous and a brief summary is pertinent.

In Bear Creek, northwest of Boise, Idaho, an expensive placer deposit containing euxenite is being developed by the Porter Brothers who have made a contract with the General Services Administration to deliver over 1,000,000 lb of combined oxides within five years. In the Nipissing district of Ontario, five miles west of North Bay, a deposit of a million tons assaying 0.845 percent Cb_2O_5 is said to be minable. The minerals are pyrochlore and uraninite. The property belongs to Beaucage Mines, Ltd. An area of weak radioactivity near the cheese making place of Oka, Quebec, was found in 1953, and has been taken by the Molybdenum Corp. of America. The rock contains a black mineral, yet unnamed, that carries 29 percent combined columbium tantalum. In the Nemegos area of northern Ontario, Multi-Minerals, Ltd., has a large magnetite-apatite orebody with promising columbium values.

In British Guiana deposits are reported in the Upper Barima River and at such geographical spots as Morabisi, Robello, Kudabari, Upper Puruni, Potaro, and Kwakwani. Both the Illinois Zinc Co. and Kennametal International Co. have prospected in British Guiana, but have withdrawn, considering the deposits uneconomic. Two other companies, British Guiana Consolidated Goldfields, Ltd., and the Morabisi Mining Co., are continuing exploration. A map of the columbite bearing areas is given in *Mineral Trade Notes*, March 1954, p. 6, published by the U. S. Bureau of Mines.

Norsk Bergverk is producing columbite at Soeve, near Ulefoss, in Central Norway. Deposits of pyrochlor are reported in Tanganyika and Uganda. Nigeria is by far the leading producer of columbium, followed by the Belgian Congo and Malaya. Nigeria produced about 2000 metric tons in 1954. A deposit of columbite is reported in Kenya, 40 miles south of Monbasi.

DIAMONDS— For 1953, the latest figures available, De Beers Consolidated Mines sold through the Central Selling Organization £43,336,109 worth of gem stones and £17,819,832 of industrial stones. The total of £61,156,000 compares with £72,000,000 in 1952. In Tanganyika, a new plant of the Williamson Diamonds, Ltd., at the Mwadui mine, Shinyanga district, came into operation about the middle of 1954. The new plant will treat 7500 tons of gravel per 24 hours. A reservoir holding nearly 2 billion gallons provides the water for treatment. In 1953 production in Tanganyika was 170,679 carats valued at £2,100,000. In Southwest Africa, Industrial Diamonds of South Africa, Ltd., has discovered a diamond bearing marine terrace at Saddle Hill, North. A detailed review of the diamond industry in the Belgian Congo and French Equatorial Africa, with a description and maps of the districts, is given in *Mineral Trade Notes* for July 1954.

World production of diamonds in 1953 amounted to 20,100,000 carats, an increase of 1,500,000 carats over 1952. Most of the increase was due to rising production in the Belgian Congo.

A booklet on industrial diamonds was published by the Diamond Association of America called "The Diamond That Pays for Itself." A book of 784 pages on diamond technology has been published by the Industrial Diamond Information Bureau. (N.A.G. Press Ltd., 226 Latymer Court, Hammersmith, London W. 6, price 5s 6d.)

Large savings from the use of oriented diamonds in drill bits has been reported. By "oriented" it is meant that a hard vector direction of the crystal is in opposition to the rock surface to be drilled.

In South Africa, an electrostatic process has been used for the final cleaning of diamonds from the other heavy minerals with which they are concentrated on the grease tables. This was developed by the Diamond Research Laboratory in Johannesburg.

DIATOMACEOUS EARTH— Overall production in the United States has approached but will probably not quite reach 400,000 tons. There are two major producers with some five or six minor producers. Production capacity for the industry for the second year has been equal to all trade requirements but the balance between capacity and requirements is again closing.

Prices for most grades of diatomite have remained relatively stable despite continually rising production costs. An important factor has been the heavy capital expenditures required for dust control in this industry.

The Pacific Coast states, California, Oregon, Nevada and Washington, have led production in this order. Minor production has been started again in New Mexico and Arizona. Diatomaceous marl has been produced from western Kansas. There has been practically no Canadian production.

Foreign production has been maintained at a substantial level in Germany, France, Denmark and Japan with minor production from Italy, Egypt, Brazil and several other countries. This European production has been mostly in lower grades and top quality products and specialties are still successfully exported from the U. S. to all of the major foreign markets.

Great Lakes Carbon Co. will operate a quarry in the Palos Verde Hills 25



Pickup in steel should help fluorspar producers for whom 1954 was a hard year

miles southeast of Los Angeles. The crude ore will be trucked to the Dicelite Division plant at Walteria, three miles away. Johns-Manville has started construction of a plant at Lompoc, adjacent to its present operations, to manufacture lime and magnesium silicates to be used as inert absorbents, and extenders in paints, insecticides, paper, etc.

Eagle Picher Co. mines diatomaceous earth near Clark Station in Nevada. Malheur Wonder Earth Co. will work deposits in the Malheur Valley, between Harper and Westfall, Ore. Both Great Lakes Carbon Co. and Johns-Manville are exploring an area in Harney County, Ore. Kenite Corp. mines and processes diatomite at Quincy, Wash. Western Ventures, Inc., has purchased a diatomaceous earth claim in the Badger Pocket area, 17 miles southwest of Ellensburg, Wash.

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FELDSPAR AND NEPHELINE SYENITE—International Minerals and Chemical Corp. has increased the flotation capacity of its plant at Spruce Pine, N. C., by 50 percent. The quality control laboratory at Kona, N. C., has been enlarged. Diamond drilling in Southern Connecticut by the same company has been encouraging and a plant is to be built there employing an electrostatic process of concentration. International has been diamond drilling the nepheline syenite deposit at Blue Mountain, Ontario, and a modern mill has been planned there. Canadian Flint and Spar Co., Ltd., has explored the northeast extension of the Blue Mountain deposits, and construction was started in the summer of 1954.

The largest feldspar operation in Canada is the Back Mine, 12 miles north of Buckingham, Quebec.

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FLUORSPAR—Nineteen hundred fifty-four was a hard year for the domestic fluorspar producers, owing to a decrease in demand by the steel industry and increased imports of all grades. The price of metallurgical grade dropped from \$38 per ton at the beginning of the year to \$28-\$29 at the end, and acid grade dropped from \$65 to \$47.50, in spite of the fact that the demand for the latter grade has held well during the year. Increases in offerings from Europe and Mexico have been responsible for the price reductions. At the same time, two federally financed flotation plants, one at Wilmington, Delaware, treating ore imported from Newfoundland, and one at North Gate, Colo., are producing large tonnages which are sold to the Government at the guaranteed price of \$65. Near the end of the year, the General Services Administration was

authorized to start buying metallurgical grade for the stockpile, but to date none has been bought. A big increase in metallurgical production resulted from a new low cost operation, southeast of San Luis Potosi, which will be described below.

The Bureau of Mines statistics on fluorspar, issued quarterly, are confusing because purchases of acid grade for the stockpile are not segregated and 42,727 tons of crude ore, imported in the first nine months for the Wilmington flotation plant, are included in the metallurgical figures. Approximately 60,000 tons of acid grade were purchased for the stockpile in the first nine months. Stocks on hand of acid grade at consumers' plants are equivalent to about three months' supply, which is not excessive, but steel mills were still carrying six months' stock. The late fall pickup in steel should help the industry soon.

In Kentucky, nearly every one of the famous old mines, many of which have produced for at least 50 years, are down. Two of the latest to shut down were the Lafayette and the Keystone. In Illinois the big mine of the Rosiclare Lead and Fluorspar Co. has been abandoned, principally because of excess water. The Aluminum Co. has still been operating at capacity, and two mines of Ozark-Mahoning which were shut down for four months reopened in October. The company is sinking a shaft on the Hill-Leford tract which will be 800 ft deep. Minerva Oil, which produces principally ceramic grade, had operated three days a week for a while, but is back on a five-day schedule. Minerva has built a five-in. pipeline for three miles from the Saline River to supply water to its mill.

In the West, except for the government-supported activity at North Gate, Colo., and the Reynolds plant at Salida, the only mines working are in Nevada and Montana, areas shielded from European and Mexican imports. Kaiser Aluminum and Chemical Co. is buying and milling custom ore at Fallon, Nev. Kaiser works its own mine, known as the Baxter property in Broken Hills at which the shaft was deepened to 800 ft. Kaiser also uses ore from the Cirac mine, the Venice Canyon mine, and two mines belonging to the Keller Brothers in Dixie Valley and Iowa Canyon. In Montana the mine of U. S. Steel 30 miles east of Darby, an open pit operation, was idle until August but has been worked since by Cummings and Roberts of California, contractors for the steel company.

In Newfoundland, the entire St. Lawrence operation is conducted to supply feed for the flotation plant at Wilmington, Del. Ore comes from the Iron Springs mine, in which the shaft has been deepened to 1000 ft, the Blue Beach and the Lord and Lady Mines.

A heavy media plant raises the grade of the mine run, prior to shipment. The Director Mine of Newfoundland Fluorspar, Ltd., has been operating steadily to supply the flotation plant at Arvida, Quebec, of Aluminum Company of Canada.

In northern Mexico, which was the scene of such intense activity in the last two years, it has been very quiet, although two flotation plants have been operating continuously. Most of the ore used at Muzquiz has come from El Tule because of the lower trucking rates from there. The American Smelting and Refining Co. mill at Agujita has run for a long time on screenings cleaned up from the "patios" where metallurgical grade was crushed and screened earlier, and on stocks accumulated earlier. Several mines on the Cuesta, at the north end of La Encantada mesa, are working, since trucking to Muzquiz down the partly finished road in the Babia valley is not too expensive.

At the end of 1953 an entirely new deposit of fluorspar was discovered in Mexico, about 60 kilometers southeast of the city of San Luis Potosi, near a village called Saliterera. Development throughout 1954 has shown that this is a major deposit of metallurgical grade spar, and a definite rush to the area was started, but the only important claims are owned or controlled by Ralph Miner of Eagle Pass. The ore occurs in or near two faults, each trending about N 70° W, which have dropped Tertiary volcanics down against Cretaceous limestone. The ore zones are in much decomposed volcanic rock, and occur in lenses with maximum widths of eight meters, and lengths, so far proven, of perhaps 100 meters. The two lenses which have been most intensively developed dip 70° north. The soft hanging wall is heavy and has to be stripped off. These two lenses are in the down throw side of the southern of the two faults. Mining to date has been facilitated because two of the lenses trend across a low hill 20 to 30 meters high, and this stripping has not yet been excessive. If these lenses continue northwest across this hill, mining at low cost can continue. However, if additional development can be in no direction but down dip, the heavy hanging wall will become burdensome and even dangerous. The other lens is a mile to the north, and the fault, and the contained ore trends across the nose of a south pointing ridge. If a northerly dip is found there, mining will soon be carried down under a high hanging wall. The ore can be screened and sorted to 90 percent CaF₂, but concentration to acid grade by flotation has not been successful in tests conducted to date. The ore can be described as very fine-grained. The production at the present time is at a high rate—300 to 500

tpd. In this isolated region wages paid are very low (5 pesos a day) which is less than half that paid in the Coahuila field. Trucking cost to San Luis is only about 30 pesos, so that the ore has been put on cars at San Luis at very low cost.

Some narrow veins in volcanic rock were discovered near the village of Paso Las Lligaras, which is 75 kms. south southeast of San Luis Potosi. One of these is being worked by Señor Romo of Muzquiz.

In Spain, a new mill financed partly by loans from the Export-Import Bank, has been started at the mines of Fluoruros, S. A., southeast of Dijon in Asturias. The mill will consist of a heavy media plant being installed by Southwestern Engineering Co., and a substantial addition is being made to the flotation plant. The added capacity will yield an additional 15,000 tons of acid grade as well as metallurgical from the heavy media plant.

In Italy there has been further expansion of the facilities of Mineraria Prealpina in northern Italy, which is now one of the largest fluorspar producers in the world, and a flotation plant has been built by Societa Monreale in Sardinia. The capacity is said to be 2000 tons of finished concentrates.

In Pakistan fluorspar has been discovered in three places. In Greenland extensive exploration of the cryolite deposit is under way by the Federal-owned company seeking new deposits, and investigating the possibility of working lower grade material.

A critical analysis of the problem of recovering hydrofluoric acid or calcium fluoride from phosphate rock was presented in *Mining Engineering* for October 1954 by two chemists of the Department of Agriculture. Their conclusions are that much research remains to be done before either product can be made in quantity, although one of the fertilizer companies is said to be ready to produce small amounts of anhydrous HF.

GEMS—The Muzo emerald mine in Colombia has reopened.

The commercial production of star sapphires and star rubies was described in the January number of *Mining Engineering* by Dr. Clifford Frondel of Harvard University.

GILSONITE—The American Gilsonite Co. has purchased 30 gilsonite claims in the Rainbow area of Uintah County, Utah. This company has successfully produced coke at its pilot plant at Bonanza, Utah. The object of the research was to produce coke of a quality that can be used as electrodes in electrolytic reduction of alumina.

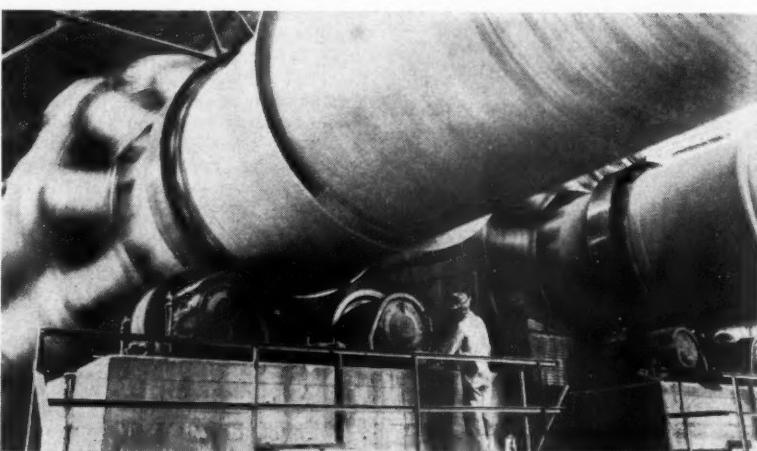
GRAPHITE—The famous old Black Donald Mine, near Calabogie, Ontario which has been worked for many years, has been exhausted and the mill dismantled. Plans to bring into operation another deposit in Bedford township, 25 miles north of Kingston, have been abandoned.

In Austria, the Kaiserberg Graphite Co. of Styria has developed a flotation process to recover finely ground graphite. It is hoped that this development will make Austria self sufficient in graphite.

GYPSUM—As in cement, the high level of construction, has stimulated the gypsum industry to considerable expansion. U. S. Gypsum has started an \$11,000,000 expansion program to include a wall board and plaster plant at Shoals, Ind., doubling capacity at Jacksonville, and the addition of a new steamship on the Atlantic sea-

30 miles north of Halifax, N. S. The deposit is said to contain 100,000,000 tons. The development will include new dock facilities in Bedford Basin, Halifax. The company's operations near Dingwall, N. S., will be closed later. The company also is expanding by 25 percent its products plants in New York, Baltimore, Savannah and Portsmouth, N. H. It is also developing a deposit near Shoals, Martin County, Ind. Western Gypsum Products, Ltd. of Winnipeg was acquired recently by the British Plaster Board, Ltd. of London. Western Gypsum is the largest producer in Western Canada and British Plaster Board, Ltd. is the largest producer of gypsum products in the British Isles, with plants in France, Erie and Britain.

IODINE—Chile, the principal producer, exported 6,343,503 kilograms in 1953, of which the United States re-



Shale for lightweight aggregate is mined, crushed and fed to rotary kilns

board. The Celetex Corp. of Chicago has appropriated \$3,000,000 to double capacity at Port Clinton, Ohio, which will include a gypsum board plant. The Kaiser Gypsum Co.'s third plant located in Seattle started production September 17. Kaiser's plants receive crude gypsum from a quarry on San Marcos Island, in the Gulf of California. One of its ships, en route from San Marcos, was wrecked on the tip of Lower California. The Rubaroid Co. has added gypsum to its line of building materials with the acquisition of Ebsary Gypsum Co., Rochester, N. Y. The purchase included a wall board and plaster plant and continuous gypsum quarries.

Columbia Gypsum is expanding its Spokane, Wash., plant to include the production of wall board and lath. The gypsum rock is obtained near Windemere, B. C. National Gypsum is developing a deposit at Milford,

received 3,183,203 kilograms and Great Britain 2,434,308.

LIGHT WEIGHT AGGREGATES—The material described under this heading is intermediate in weight between vermiculite, pumice and perlite on the one hand, and sand and gravel aggregate on the other. It is manufactured from shales, clays and slates, clinker from coal, and scoria, a volcanic product, sintered fly ash and expanded blast furnace slag. This is about the fastest growing non-metallic industry. Forty-one plants are in operation or under construction in 20 states, all built within the past ten years. The most important raw materials are the shales and clays which are "bloated" at temperatures of 1000 to 1200° C. The process of manufacture employed by the Texas Industries at Dallas can be described as

typical. The shale is mined, crushed and fed to rotary kilns, then dumped in a pit for slow cooling. The clinker is then crushed and screened. Much of it is then made into a light weight concrete block, standard size, weighing 21-28 lbs instead of the 45 lbs for a regular concrete block, but many other sizes and shapes are made, and in various colors. A similar block has been developed by Armour Research Foundation. It provides high insulation and a load bearing strength of 1000 psi. A plant built at the cost of \$1,000,000 has just been finished at Richmond, Va.

In Canada, light aggregate is made from foamed slag at Hamilton. A new plant was put in operation at Calgary by Light Weight Aggregates of Canada, Ltd., and in Winnipeg, Supercrete, Ltd. is building a \$200,000 plant. The expanded shale aggregate industry in the Pacific Northwest was described by A. O. Bartell in the Raw Materials Survey. The Keasy shale which underlies a large area in Columbia and Washington Counties, Ore., is the raw material now used by two large plants.

LIME AND LIMESTONE—It is obvious that this tremendous subject cannot be covered in the space of a brief general review. One of the most newsworthy developments during the year is the establishment of Port Dolomite, on Lake Huron where 3,000,000 tons of high grade dolomite will be shipped annually by the U. S. Steel Company, Michigan Limestone Division. The quarry is five miles from Cedarville, Mich. and is part of the Engadine formation of Niagara age (Silurian). Another new large scale operation is at Durkee, Ore., where the Morrison-Knudson Co. has established a quarry in a limestone, assaying 98 percent CaCO_3 .

LITHIUM—1954 was a boom year for lithium which resulted from a steady increase in lithium requirements. Because of the fact that much of the lithium goes into classified uses, production statistics are not available. The leading producer, Foote Mineral Co., expanded its mining and milling operations at Kings Mountain, N. C., and its refining plant at Sunbright, Va., at a cost of several million dollars. The Lithium Corp. of America announced that it is building a plant at a cost of \$7,000,000 at Bessemer City, N. C. Lithium Corp. and Quebec Lithium Corp. made a five-year contract under which Quebec Lithium will furnish spodumene concentrates for refining at Lithium Corp. plants at Minneapolis and Bessemer City. Quebec Lithium found a deposit of 10,000,000 tons assaying 1.3

percent Li_2O in LaCorne Township, 25 miles north of Val d'Or, in northwestern Quebec. A shaft 700 ft deep is planned. Lithium Corp. has acquired 36 claims of its own in the Cat Lake Area, 90 miles northwest of Winnipeg, Man. A review of all of the deposits of Lithium in Canada was published in the August 1954 issue of *Economic Geology*. A map on page 5 of that article shows the location of the Val d'Or deposits. Lithium Corp. also has mines in the North Carolina field.

A third large scale development was announced recently. The American Potash and Chemical Co., which has been recovering lithium salts from the brines at Seales Lake, Calif., for several years, has joined with the American Metal Co. and Rhodesian Selection Trust to build a \$6,000,000 plant near San Antonio, Tex. The ore deposit which is also jointly owned is a lepidolite mine in Southern Rhodesia near Fort Victoria. The mine will be operated by Bikita Minerals, Ltd. A number of other companies are prospecting for lithium in each of the major areas of the world, including the Lepidolite Development Corp. in Southern Rhodesia; the United States Lithium Co. in Colorado; Parbec Mines, Canadian Lithium, and others in the Val d'Or area; and several at Bernie Lake, Pointe du Bois, Man. W. B. Mather described a number of lithium occurrences in Brazil, in the September number of *Mining Engineering*.

Preliminary development work is being done on a lithium claim in Wyoming's Rattlesnake Mountains north of the Sweetwater River. Spodumene in the ore assays from six to eight percent Li_2O . The spodumene will be shipped to the Minneapolis, Minn., plant of the Lithium Corp. of America.

MAGNESITE—Like fluorspar, magnesite suffered from a slackening in demands of the steel industry, and an increase in imports from abroad. The demand in 1954 was hardly 50 percent of that in 1953, and as a result one major producer was shut down for six weeks in the spring. The industry is seriously concerned over imports since American plants producing high purity brick, ramming mix and castable products are as essential to National defense as the steel industry itself, since furnaces must have linings.

Northwest Magnesite doubled its ball mill capacity at its Finch quarry and installed an automatic loader. The traction cable of the Keystone and Red Marble quarries of the same company was lengthened 16 miles.

In Canada, the Aluminum Company of Canada works brucite deposits at Rutherglen, Ont., and Bryson and

Wakefield, Que. Calcined material is sold to the Canadian Refractories plant at Kilmar, Quebec, but much is shipped to Arvida for the manufacture of magnesium metal. Austrian production of crude magnesite and caustic calcined magnesite increased in 1953, over 1952. Yugoslavia pushed its exports of magnesite during the year. Harbison-Walker conducted diamond drilling at its deposits at Oros, state of Ceara in Brazil.

MICA—A sharp decline in the production of electronic and heavy electrical equipment resulted in a large decrease in the total United States consumption of muscovite block, film and splittings. However, the demand for strategic qualities for stockpiling and consumption continued at a high level. Wet-ground mica consumption was about six percent greater than in 1953 and dry-ground mica consumption was about the same as in 1953.

General reviews of the mica industry were published by A. E. Williams in the *Mining Magazine of London*, for December 1954, and by the *Mining Congress Journal* in October 1954; and charts simplifying mica grading were published in the January issue of the *Engineering & Mining Journal*. India supplies 80 percent of the world's mica requirements, most of which is produced at Hazaribagh, Gaya and Manghyr in the State of Bihar. In the United States, North Carolina and New Hampshire are the leading producers. The Government has maintained a depot for purchases at Spruce Pine, N. C. This was shut down temporarily in March 1954, following an investigation by the FBI after miners had complained of unwarranted downgrading. A new superintendent was installed. Later purchases were on an increased scale reaching \$187,229 in July. The depot had purchased a total of \$3,468,722 in the first 24 months of its operation. The American Society of Testing Materials eased the specifications on mica. Providing the mica can pass successfully the Q meter test, color is no longer of importance. Newcomers in the mica industry are reported in Nevada (Nevada Mica Mfg. Co.) and in New Mexico where the Petaca Mining Corp. has 22 mining claims. A \$300,000 mill is planned. New facilities for ground mica were planned by the Blue Ridge Co. near Penland, N. C., by International Minerals and Chemical Corp. around the lake formed by Nolichucky Dam in eastern Tennessee. In British Columbia, the B. C. Mica Co. of Vancouver is developing claims on Sitklan Island and on the adjacent Alaskan mainland.

The most important news item of the year is the establishment of a successful synthetic mica industry at

East Caldwell, N. J. The Mycalex Corp., which has been an important producer of mica products, has formed a subsidiary, "Synthetic Mica Corp.," and plans to produce on a scale of 1000 tons per year, which is about ten percent of present U. S. imports. Development was done at Norris, Tenn., in a plant operated originally by the U. S. Bureau of Mines. The raw materials are magnesia, silica, alumina and potassium fluoride. These are fed into an electric furnace that will take a charge of 25 tons. The furnace is a steel cylinder 10 ft in diameter and 10 ft high, with two graphite electrodes five ft apart. The furnace is charged almost to the tips of the electrodes, and then a thin layer of graphite is spread to form a bridge for initial surge of current. When the mix starts to melt, the furnace is filled with the charge. The reaction takes 80 hr, after which the furnace is allowed to cool slowly for a week to 12 days. When the furnace is opened there is a high mound of white mica. Within the mound are crystals $\frac{1}{16}$ -in. thick and up to 16 sq in. in area. The outer shell will be crushed and bound into a solid state with glass, a familiar product of Mycalex which has made the glass bonded mica products for electronic insulators. The synthetic mica has an advantage over the natural because it can work in temperatures up to 950° F., 300° above the maximum that natural mica can stand.

Brush Beryllium Co. of Cleveland has been operating a pilot plant that turns out about 500 lbs of synthetic mica per week. Its process was developed under a grant by the Office of Naval Research. A mica paper can be made from fines, by typical paper-making processes.

MINERAL WOOL—The Mississippi Valley Experiment Station of the U. S. Bureau of Mines conducts tests on materials submitted from all over the United States as to suitability for the manufacture of rock wool. An interesting material examined during the year was staurolite, a by-product of ilmenite operations at Starke, Fla. By blending in small percentages of fluxes, blowable melts were obtained which are far above white wools and better than most dark wools in heat resisting quality.

MONAZITE—According to the New York *Times* for January 5, 1955, the Atomic Energy Commission has now admitted that it can use thorium as a reactor. This news explains all of the activity that has been stirring in monazite for the last two or three years. The most important domestic field is in the Cascade Valley, on the north side of Big Creek, four miles southeast of the town of Cascade,

Idaho. The U. S. Geological Survey has stated that placer deposits suitable for mining by large dredges are valley fills formed as a result of Pleistocene block faulting, fills formed by damming of streams by glaciers, or formed by aggradation caused by accelerated erosion with an increase in load during glacial conditions. The placers contain no boulders and bed rock has not been reached. Eighty to 85 percent of the gravel will pass a $\frac{1}{2}$ -in. screen. The gravels carry 15½ lbs per cu yd of black sand, of which 7½ percent is monazite. Two companies are active—Baumhoff-Marshall Co. and the Idaho Canadian Dredging Co. Warren Dredging Co. was working, but its dredge was destroyed in an accident. The Gem Monazite Mines and J. R. Simplot Co. also have leases in the area. The dredges used are bucket dredges with an average daily capacity of 5000 cu yd. The buckets dump into a long trommel, which eliminates the coarser quartz pebbles. The trommel fines are concentrated on Pan-American jigs. The black sands are screened on 24 mesh, the oversize being mainly ilmenite which is discarded. The fines are monazite, garnet and zircon. These are taken to Cascade, dried and treated on Carpcor electrostatic separators similar in design to those used at the Trail Ridge, Fla., ilmenite operations. Because of these large scale operations the government is no longer short of monazite.

Porter Brothers of Boise are starting an operation 95 miles northeast of Boise on Bear Creek, to recover monazite and euxenite. Test drilling of black sand deposits in the Wood River Valley, near Hailey, Idaho, has been conducted by the U. S. Bureau of Mines. A map of the Little Johnnie monazite deposits in Gunnison County, Colorado, has been released by the U. S. Geological Survey.

The Government has made a deal with Brazil to swap wheat for monazite produced there.

OLIVINE—Olivine is being produced in the Twin Sisters Mountains, 20 miles north of Hamilton, in Skagit County, Wash., by a company called Scheel Olivine, Inc. The deposit is said to be very large. Research in the University of Washington has shown it to have uses ranging from foundry sand to fire brick.

PERLITE—The Perlite Institute held its 5th annual meeting with 55 miners and processors, representing 31 companies in 20 states and England and Australia, in attendance. This activity is a measure of the rapid development of this industry. In its crude form perlite is found in seven western states where Tertiary vol-

canics yield suitable material. The perlite is mined in open quarries, crushed and screened at the mine where it is worth from \$6 to \$12 per ton. It is shipped to 100 processing plants in 40 states, Canada, Cuba and Mexico, where it is expanded to a lightweight aggregate. Expansion of 2 to 20 times is possible, but three to five times is average. The expanding agent is water or CO₂ dissolved in the rock. A variety of types of kilns are used. Recent designs provide a pre-heater inside of a revolving kiln to utilize waste heat. Another type uses a revolving pre-heater located directly over a stationary kiln. A plant west of Midland, Texas, uses two kilns. A 2½ by 22-ft rotating kiln turning at eight rpm heats the feed to 1050° F. It is discharged to a 4 by 18-ft rotary kiln turning at 10 rpm. In this kiln the perlite expands like popcorn, and it discharges at 1250° F. Some processors use vertical kilns in which the raw feed drops down into the flame, where it expands or "pops." The light material is carried out of the kiln by air currents into cooling bins. In most operations the sizing is done by air.

The bulk of the aggregate is still used for plastering, although business in lightweight insulating concrete is very active. For concrete the material should weigh 7½ to 12 lbs per cubic foot and be sized between 8 and 100 mesh. An outstanding example of its use was in the Alcoa Building in Pittsburgh where perlite concrete 4 in. thick and with a strength of 2000 psi was used in the wall, being sprayed on an aluminum lath. It was also used in the concrete on the underside of the floor and in all plaster. A weight saving of 10,340 tons was effected. In the huge sub-zero warehouse of Continental Freezers of Illinois, Inc., in Chicago, 275,000 cu ft of perlite concrete was used to insulate the floor and roof deck. Perlite fines, eliminated from plaster and concrete sands, are being used as filtering materials in mud additives for the oil industry, and a great variety of miscellaneous uses.

An innovation in exploration was the diamond drilling of a deposit east of Sheaville, Ore., in 1954. Core recovery was reported as excellent. Western Canadians are also becoming interested. A deposit south of Francois Lake in British Columbia was developed. The crude is brought to Calgary for processing. This is the second plant in Calgary, since Western Gypsum, Ltd., has had a plant there for several years.

REFRACTORIES—The demand in the refractory field is for more resistance against higher heat. *Chemical Week* for October 9, 1954, stated: "The high temperature researcher must wait in frustrated silence while

his counterparts in the refractory industry go about the arduous job of developing materials to contain his chemical infernos." At Lawrence, Kans., a nitric acid plant built for the Army is operating at over 2000° C in a two-chamber furnace lined with magnesia brick, and filled with magnesia pebbles. In the Wulff process for making acetylene from natural gas, refractories must withstand continuous operations at 1300° C. Alumina is now being used. Norton Co. of Worcester is putting a great deal of stock in zirconia, making a stabilized form by electrical fusion of 94.5 percent ZrO_2 and 4.5 percent CaO. The lime is added because this prevents the inversion from tetragonal to monoclinic form, which takes place at 1000° C with a large volume change. Several other companies are pushing zirconia refractories, including International Minerals and Chemical Corp. which has acquired Sonsel Refractories at Brighton, Mass. The Zirconium Corp. of America has a plant at Solon, Ohio. Boron nitride is made by Norton which claims it to be an ideal thermal insulator in induction and resistance furnaces. Its price is \$46 per lb. Boron carbide is used in nuclear reactors as a neutron absorber. Others under investigation are TiC_4 , TiB_2 , ZrB_2 , CrB , HfC_4 has a real potential. Stanford Research Institute of Palo Alto has a refractory of 75 percent SiC_4 , 25 percent $MoSi_2$, with a trace of titanium diboride.

In the more standard materials, several newsworthy items developed during the year. Illinois Clay Products Co. has a new silica refractory with a chemical produced phosphoric acid as the binder. The manufacturer claims it will withstand heats to 4000° F. The domestic kyanite industry is now producing at a sufficient rate so that the U. S. is no longer dependent on imports. The principal producers are Commercialores of New York which has deposits at Clover, S. C., and Kyanote Mining Co. with a property at Farmville, Va. A new kyanite deposit in Shoshone County, Idaho, was described by the Idaho Bureau of Mines and Geology.

General Refractories, Ltd., of England is developing deposits of massive sillimanite in Southwest Africa. Pella Refractory Ores, Ltd., is working a deposit of corundum-sillimanite near Pella in Namaqualand, South Africa.

SALT—The Canadian Rock Salt Co. has been sinking a shaft at Ojibway, Ontario. Throughout the whole depth of 720 ft the wet running ground through which the shaft is being sunk is consolidated by freezing. Twenty-eight freeze holes 10 in. in diameter were drilled in the circumference of a circle 32 ft in diameter. Brine at minus 20° F is produced from

a 200-ton refrigeration plant. As the ground becomes frozen, sinking of the shaft 16 ft in diameter proceeds within the frozen cylinder.

SANDS—Silica sand has become an ore. High grade Ottawa, Ill., sand is being used as the ore of silicon, now being produced in quantity for transistors by E. I. du Pont de Nemours & Co. and the General Electric Co. Another important and relatively new use for sand is as a medium to open up fractures and increase the size of pores in oil bearing horizons. Standard Silica Co. at Ottawa sells a uniformly graded sand under the trade name of Hydrox Frax. This is mixed with jelled gasoline as a carrier, and pumped into wells under a pressure of 5000 to 8000 psi.

SLAG—Staff members of the Dominion Iron and Steel Co. published results of a study of blast furnace slag in the *Canadian Mining and Metallurgical Bulletin* for March 1954. Iron blast furnace slag is becoming a versatile industrial mineral, and with 40,000,000 tons available annually there is plenty with which to work.

There are three types of slag; air cooled or hard slag, granulated or water quenched slag and lightweight or expanded slag. The chemical composition of slag is relatively uniform and is basic in character which refers to the arbitrary ratio of bases to silica. It is hence hydrophobic and bituminous cements adhere to it more strongly than to siliceous surfaces. Being basic it can be used in agriculture as a neutralizer of soil acids. Air cooled slag is crushed for use as an aggregate. It is durable and highly resistant to natural weathering, temperature fluctuations and freeze-thaw conditions. It stands up well in sodium sulfate and Los Angeles rattler tests used for appraisal of concrete aggregates.

Air cooled slag has been used as an aggregate in macadam, bituminous and concrete high construction for highways and for many of the largest and most important airport runways in the U. S. Ground granulated slag has excellent hydraulic properties and can be used as a raw material.

Expanded slag is formed by foaming molten slag with a controlled amount of water. The rapid generation of steam expands the slag into light vesicular material. The air bulk density is from 40 to 60 lbs per cu ft. It is sold under such names as Celocrete, Waylite, Superock and Enslite. Most of it goes into the production of pre-cast concrete blocks and pre-cast roof and floor slabs.

The National Slag Association meeting in Washington in October called attention to the growth in sales volume

from 16,706,792 tons in 1946 to 30,511,600 tons in 1953. In 1954 there was actually a shortage of slag in some areas. Fully revised proportioning tables for the use of slag in concrete were released in 1954. It was pointed out that one-fourth of the Ohio turnpike now under construction is being built of slag. Pennsylvania is using slag for the surface course in resurfacing 22 miles of its turnpike, principally because of its skid-resistant properties.

Open hearth slag is not recommended for concrete or base courses because a number of failures have resulted from its use, although in Detroit it is used in secondary roads, and in Chicago the open hearth slag, being higher in silica and lower in free lime than from other steel mills, has been used successfully including concrete.

SODIUM CARBONATE—The Trona deposit in Sweetwater County, Wyo., was described in the *Mines Magazine* for May 1954. Production started in 1953. The trona bed which underlies many square miles and lies about 1500 ft below the surface is about 10 ft thick. It is served by two shafts, one for hoisting and one for ventilation. Underground haulage is by belt conveyor, although shuttle cars feed the ore from face to hopper. The surface plant is designed to handle 1000 tons per day. The trona is crushed, screened and some is calcined to utility grade soda ash. The fine material from the crushing plant is dissolved, the solutions clarified, and sent to the crystallizers during all of which the solutions are held at or near boiling. Crystallization is done under vacuum. The pure crystals are then calcined to make "light ash." Some of the light ash is redissolved and dried to make "dense ash."

Process water is brought nine miles from the Green River. Gas from local gas fields is the fuel used. Power is generated through two 4000 kw Westinghouse steam generators.

SODIUM SULPHATE—During 1954 the demand for sodium sulphate showed a substantial increase throughout the United States, Canada and in parts of Europe, as well as in Australia and New Zealand. The increased demand for sodium sulphate came primarily from the paper industry as a result of the completion of many new paper mills. The old established paper mills also increased their demand for sodium sulphate during 1954 in an attempt to help meet the requirements for more paper. The glass and detergent manufacturers also stepped up their demand for sodium sulphate during 1954.

In the face of this greater usage of sodium sulphate, there has been a re-

duction in the amount of sodium sulphate produced in the United States, particularly by-product sodium sulphate from the rayon and hydrochloric acid industries. On the other hand, producers of natural sodium sulphate (thenardite) commenced serious investigations into the possibilities of increasing the domestic output of the natural material. Some interest has been shown by paper manufacturers in such large undeveloped natural deposits of sodium sulphate as that existing near Grenora, N. D.

SLATE AND STONE—Operations during 1954 reached a low point in midsummer, leveled off and showed a slight increase in all phases during the last few months of the year. At the end of the year inventories were in line and a stable situation appeared likely for some months ahead and prospects appeared good for an increase in demand in the spring of 1955.

A temporary increase in demand for roofing slate was caused by the hurricane damage by Carol, Hazel, etc.

During the past year there has been developed a considerable market for natural colored slate from Vermont as tops for cocktail tables, dining-room buffets, chests, etc. In addition, continued research is going on for di-

a synthetic slate for specialized uses, thus adding another potential outlet for waste slate.

Prospecting for new deposits suitable for development of crushed stone has been active during the year, as new centers of use arise with city expansions and with the planning of super highways.

There has been considerable improvement in jointed steels for use in deep hole drilling with percussion drills. This has led to increased use of smaller holes with better primary breakage from blasting and in some cases lower costs per ton. In the less abrasive rocks rotary drills have continued to replace other methods. Altogether, churn drills seem to be about a thing of the past.

Drop balls have continued to replace drilling and blasting for secondary breakage. In many quarries jackhammers are no longer seen. The highly mobile boom mounted drifter has found favor in some quarries for secondary breakage where the drop ball does not work too well.

Diesel equipment for quarry haulage has almost entirely replaced gasoline equipment now. Because of their adaptability to varying conditions, rear dump trucks seem to be gaining in favor.

Considerable progress has been made during the year in jet piercing

by the International Talc and Gouverneur Talc Companies. In the West, Tri-State Minerals in Ogden, Utah, has installed a fine grinding unit in which the talc is pulverized by steam. The Sierra Talc & Clay Co. rebuilt its Los Angeles mill and has installed a Raymond vertical mill to micronize talc. The same company has increased its facilities at its Yellowstone mine in Montana.

Block steatite which is in short supply can be replaced in some uses by talc which is bonded together with phosphate, or by synthetic mica bonded with phosphate.

VERMICULITE—The Zonolite Co. is continuing to expand its operations. It has acquired processing plants in Elwood City, Pa., and in North Bellmore, Mass. It is spending \$350,000 to modernize its milling facilities at Libby, Mont., and is putting a processing plant at St. Thomas, Ontario, which is the eighth vermiculite plant in Canada. Zonolite announced a wall panel made of vermiculite, slag, oil and water called Modern-Crete. It is supplied in 8 by 16-ft panels, in varying thicknesses. Western Mining Corp. has started a new vermiculite-perlite processing plant at Nampa, Idaho. Siscoe Vermiculite Mines, Ltd., is building a plant at Rexdale, in the outskirts of Toronto. Vermiculite ore for this plant will come from South Africa.



While vermiculite operations in North America were expanding rapidly, ore for some processors came from South Africa

versification in the industry and in the utilization of waste materials.

Changing modes of American life reportedly are reviving the slate mining industry after a long period of low activity. Recent trends in more colorful home-building design, originated in Florida and southern California, are spreading throughout the country, mostly in suburban areas. These new types of residences, featuring outdoor living inside and out, call for multiple uses of colored slate in terraces and patios, floors, walls and roofs. A trade association has been organized to improve and promote the industry as a whole. Other new developments in the slate industry include: development of a method for converting waste slate into a marketable aggregate for the production of lightweight concrete block; and a new process, which is in pilot plant production, to manufacture

for channeling in dimension stone and granite quarries. This is apparently an outgrowth of the jet piercing for blast hole drilling, a process now used in several quarries with highly abrasive rocks.

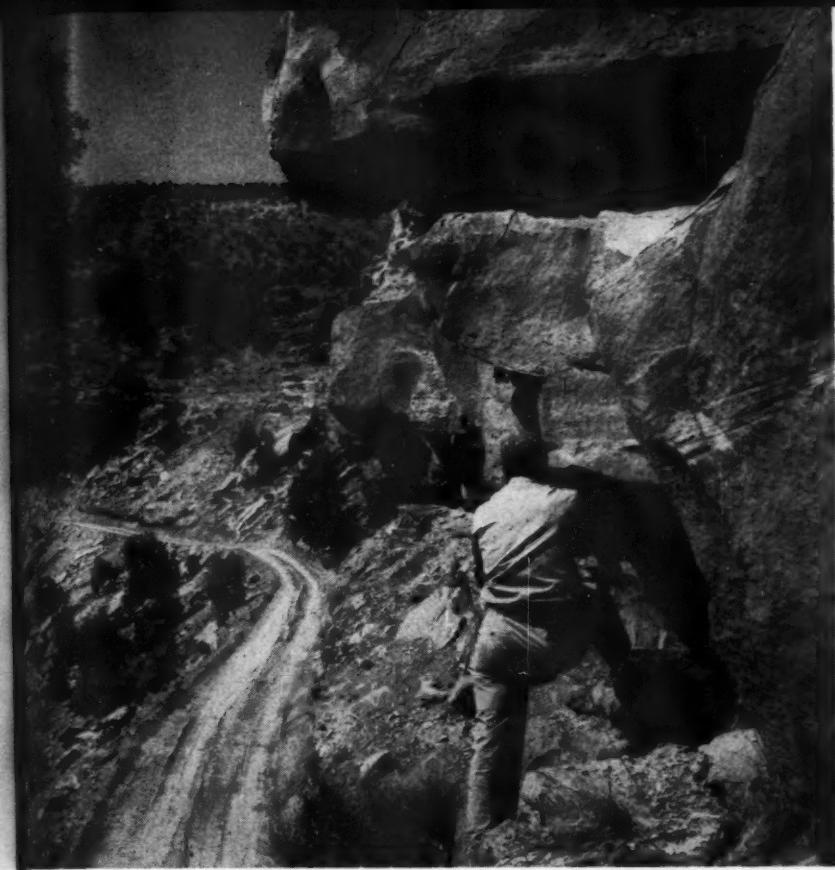
TALC—Demand increased in 1954, and on the east coast was 15 to 20 percent better. Prices of some grades were increased \$1 and others \$2. This was the first increase in the price of talc products since 1950. The demand was strongest for finely ground talcs used in paint and tile. Because of the acquisition of Loomis Talc Co. by International Talc in Gouverneur, N. Y., one of the seven talc mines was shut down.

Also in New York State the Reynolds Talc Co. has started operations on a mine located close to those operated

WOLLASTONITE—The sole producer of this material is carrying on an intensive program to introduce this material to the ceramic and paint industries. This material is mined, milled and beneficiated at Willsboro, N. Y.

ZIRCON—For zircon this was a comparatively uneventful year. There was no major change in the production and demand for zirconium ores. The moderate-sized zirconium chemical industry also encountered a few major developments. It is reported that there was some increase in interest in stabilized zirconium oxide for refractory use. The two principal producers of zirconium tetrachloride, the basic zirconium chemical compound, continued to be National Lead Co. and Carborundum Metals Co. The U. S. Bureau of Mines also operated its zirconium chemical plant at Albany, Ore., during 1954.

There are few happenings in zirconium metal. Carborundum Metals began production of zirconium metal sponge in their new plant during 1954. The second largest commercial producer of zirconium metal continued to be the Foote Mineral Co. National Lead Co. continued to produce moderate quantities.



Geologic studies led to discovery of many uranium deposits on Colorado Plateau

Mining Geology in '54

Activity Followed the Broad Lines Blocked Out at the
End of World War II

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Behre Dolbear and Co.

MINING geology—the application of geology to an understanding of mineral resources in aid of exploration, exploitation, and utilization of mineral wealth—has continued in 1954 the broad lines blocked out at the close of the second World War. Aside from petroleum and ground water geology, regarded as beyond the sphere of this paper, perhaps the most significant general trends in the past year have been (1) the world-wide boom in uranium exploration, (2) the rapid expansion, especially by discoveries in Labrador and South America, of the world's iron reserves, hitherto regarded as dwindling, (3) the growing stress upon improved methods—geochemical, geophysical, structural and

mineralogic—for exploring from the surface, (4) increasing attention to problems of personnel training, and (5) fortunately the dawning awareness, largely through government agencies in the United States and Canada (if these countries may be taken as examples), of the need for basic research if mineral exploration is to be reasonably successful in the face of diminishing surface deposits.

Uranium Deposits

Just as World War II stimulated conspicuously the exploration for pegmatite minerals and certain ferrous alloy metals, so the dramatic events toward its close focussed attention on mineral sources of fissionable atoms

as major war materiel and, later, source, of industrial energy. All the leading journals of mineral exploration and economic geology in both hemispheres devoted much space to the occurrences and genesis of uranium ores—the chief present sources of atomic power—and to techniques by which they could be discovered. Yet oddly enough only two major books seem to have resulted. The volume "Minerals for Atomic Energy" by R. D. Nininger, of the U. S. Atomic Energy Commission, an active participant and director in uranium exploration in the United States, appeared in the middle of the year in the U. S. A.; this book is comprehensive in treating the geology of deposits of uranium and other radioactive elements and contains a valuable digest of laws relating to prospecting and mining for such materials. A kindred book, "Uran," by E. Kohl, was published about the same time in Stuttgart, Germany.

Uranium Deposits Described

A summary of the geology of uranium occurrences and prospecting methods was presented by R. J. Wright (Eng. Min. Jour., vol. 155, pp. 91-95, 1954) and a short regional report in French had appeared in 1952 (Roubault, M., *La recherche et l'exploitation des minéraux d'uranium en France et dans l'Union française: Mem. Soc. Ing. Civ.*, vol. 105, pp. 95-126, 1952). In the Western Hemisphere north of the Rio Grande search had been concentrated mainly on two kinds of deposits—the "Colorado Plateau" type and the vein type. The former had been particularly sought in the Plateau area but occurrences, significantly similar to those of the Plateau and of the Witwatersrand, South Africa, were found lately in the Algoma district or Blind River basin of Ontario (Joubin, F. C. Uranium deposits of the Algoma district, Ontario: Can. Min. Met. Bull., vol. 47, pp. 673-679, 1954). A succinct and useful comparison of the major uranium sources, with special stress on the Colorado Plateau type, was prepared by Everhart (Mining Eng., vol. 6, pp. 904-907, 1954) and represents perhaps the most terse yet thoughtful discussion of this type published in 1954; Rosenzweig, Gruner, and Gardiner (Econ. Geol., vol. 49, pp. 351-361, 1954) presented evidence that the characteristic primary uranium mineral in the Plateau, uraninite, was deposited under reducing conditions. In contrast with the tentatively hydrothermal explanation previously given by C. F. Davidson, the Witwatersrand, one of the world's great uranium reserves, was assigned to a fundamentally organic origin, though, as in the Colorado Plateau, to a reducing environment (Miholic, Stanko, Genesis of the Witwatersrand gold-uranium

deposits: Econ. Geol., vol. 49, pp. 537-540, 1954). When the various conflicting views are generalized, it would seem that reducing (possibly hydrothermal though possibly also sedimentary), rather than oxidizing and clastic sedimentational conditions would seem to be the more acceptable explanations for this rather widespread type of uranium deposit, but the question is still an open one. In any case, "channel control," appears to be emerging as the major structure that localizes ore deposition.

Meanwhile the richer but more restricted uranium deposits have not lacked descriptions. Thurlow and Jarrard summarized the rather modest possibilities of the Boulder batholith as a source of uranium (Mining Eng., vol. 6, pp. 217-220, 1954); the now well known copper-uranium ores of Rum Jungle, Australia, were briefly described by Ward (Mining Eng., vol. 6, pp. 1169-1171, 1954); and the mineralogy of the uranium ores of Caribou, Colorado, were discussed by H. D. Wright (Econ. Geol., vol. 49, pp. 129-174, 1954), several periods of ore mineralization being recognizable.

Explore Iron Deposits

Second great class of metalliferous deposits especially marked by exploration were the sedimentary iron ores of the Lake Superior type. The past 15 years witnessed in South America the discovery and steady development of the great deposits of Venezuela iron ore found by the two leading American steel corporations—United States and Bethlehem. Added to those already known in Brazil, these bodies seem to give South America the leading or at least second place in world iron reserves. Somewhat more recent has been the development of the closely similar ores of eastern Canada. In the June issue of MINING ENGINEERING (vol. 6, pp. 593-602), Gustafson and Moss describe the geological work involved in the discovery and development of the deposits in Labrador controlled by the Iron Ore Co. of Canada—an undertaking extending from 1942 to 1954 and necessitating the expenditure of approximately \$10,000,000 in exploration alone. A total of 14,920 sq mi were mapped, and 231,000 ft of drilling were completed. Fifty-two prospecting teams of two or more men each were employed—in 1952 alone 68 geologists and their student assistants. As a result, reserves of 417,000,000 tons of ore were developed.

It is significant that this work was planned, directed, and almost wholly carried out by geologists. This is probably one of the largest and most successful geological exploration programs ever carried out—certainly in fields other than petroleum.

In the Lake Superior region south of the border, Gruner recently undertook an estimate of taconite reserves.

Making reasonable assumptions as to depths, grades, and milling possibilities, he concluded that five or six billion tons are available by stripping to reasonable depths; for underground operations the reserves would be very much greater (Mining Eng., vol. 6, pp. 287-288, 1954).

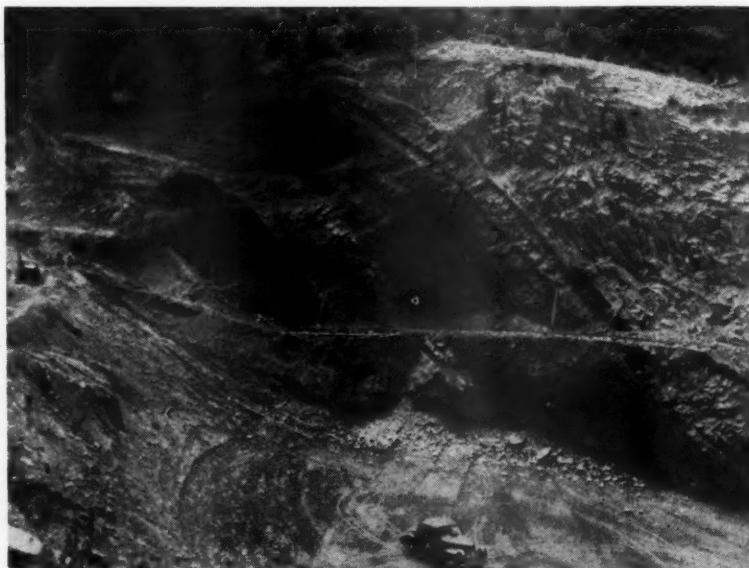
Of far less importance, yet of value to smaller operators are the studies of brown iron ore reserves of Missouri by Clark and Muilenberg (Mining Eng., vol. 6, pp. 63-66, 1954), who list only some 100,000 tons of high grade ore but perhaps enough to last 5 to 20 years at current consumption rates.

Non-Ferrous Metals

Among the recently discovered deposits of non-ferrous metals in the United States, the newly opened ore body at Silver Bell, Ariz., operated by the American Smelting and Refining Co., has been of much interest. Its structural control was discussed by

German geologists who have studied Mansfeld, namely that both deposits are primary and sedimentary. Strikingly similar inferences are drawn by G. R. Davis for the Roan Antelope copper deposits of Northern Rhodesia (Econ. Geol., vol. 49, pp. 575-615, 1954). There seems thus to be a growing conviction that much of the copper in shales the world over may be syngenetic and sedimentary in origin, not hydrothermal.

In strong contrast are the several recent studies that have appeared, dealing with the copper ores of the western states of the U. S. A. Foremost among these in interest to the economic geologist is the address by Sales on his receiving the D. C. Jackling Medal of the American Institute of Mining and Metallurgical Engineers (Mining Eng., vol. 6, pp. 499-505, 1954). In this summary of several exceptionally well studied deposits, notably those of Butte, Potrerillos, Cananea, and Ajo, three types of cop-



Geology of coal has been actively investigated by chemists, coal petrographers and field geologists

Richard and Courtright (Mining Eng., vol. 6, pp. 1095-1099, 1954). Another recent copper rediscovery is now coming into production under the Copper Range Co. and the White Pine Copper Co. This native copper-chalcocite deposit in the pre-Cambrian Nonesuch shale and underlying conglomerate at White Pine, Mich., has been described recently by White and Wright (Econ. Geol., vol. 49, pp. 675-716, 1954). It has much in common with some phases of the Mansfeld copper ores of Germany, though the German ores are wholly sulfides. It is interesting that the conclusions of the American authors as to the origin of the White Pine ores are much like those of many (and probably most)

per deposition were distinguished. The "magmatic" type is chiefly characterized by mineralization "indigenous" to late porphyry intrusions; the "hydrothermal" type is marked by later, hot water mineralization rising along fissures that cut all the intrusions; and the "late magmatic" type is intermediate between the two others. The wealth of experience and detail of study lends these views particular importance.

Structural Control and Its Bearing on Mining

A basic objective of mining geology continues to be the discovery of the controlling structures of a given de-

posit of ore or industrial mineral. Many instances in 1954, unpublished or published, illustrated this application of basic principles.

In a study of the Guadalupe Mine, N. L., Mexico, Whiting finds that ore is located at contacts between the flat faults that characterize the deposit and are almost along bedding planes and vertical dikes (Econ. Geol., vol. 49, pp. 493-500, 1954).

What is essentially a theory of structural control through direction of solution flowage, is used by Thompson to explain transport and deposition of quicksilver at Terlingua, Texas (Econ. Geol., vol. 49, pp. 175-197, 1954), in an article otherwise largely devoted to geochemistry.

Clark (Mining Eng., vol. 6, pp. 812-816, 1954) has furnished an outline for the practical use of geology in selecting and controlling underground mining methods, especially where the strength of the country rock and the form and compactness of the ore body are important factors.

Government Geological Surveys

In any prospecting campaign—whether geological, geophysical, or geochemical—the basic data for all exploration are maps—topographic, geologic, geophysical—and the more detailed and better, the more the prospector and miner has his work facilitated. The federal, state, and provincial surveys of the United States and Canada have been especially active in this respect, increasing the tempo of peace-time work resumed in 1945. Without in any way abandoning classical geologic mapping, stress has been placed on the preparation of geophysical maps of larger areas as guides to detailed geophysical and geological prospecting.

Of particular interest is a new experiment by the Geological Survey of Canada. Faced with the need of mapping the two-thirds of that large country hitherto unmapped, the G.S.C. has begun to use helicopters. They were first employed by the Survey on Operation Keewatin (1952) in the barren lands. During this program 57,000 sq mi of the southern part of the District of Keewatin were mapped at a cost of \$3.63 per sq mi by five geologists using two helicopters and a supporting airplane. The resulting preliminary maps of this work were published the following summer. During 1954 Operation Baker was carried out in the central part of the District of Keewatin. Five geologists, using two helicopters and a supporting airplane mapped 67,000 sq mi at one inch to eight miles at a cost of about \$2.20 a sq mi. This program is to be continued as Operation Thelon (1955) in the District of MacKenzie. By this method mapping of the barren grounds of the Canadian

pre-Cambrian Shield can probably be completed within a decade or so.

In 1954, five geologists using a helicopter mapped an area of 800 sq mi on Cape Breton Island for publication of a map on a scale of one mile to an inch. Helicopters were also used in the mountains of British Columbia and in rugged Newfoundland by geologists of government and private mining companies in exploratory work.

While this method is not particularly applicable to heavily wooded regions, there are many parts of the U. S. A. where it would appear feasible.

Geology of Coal

The geology of coal has been actively investigated by chemists and coal petrographers, as well as field geologists. Particularly significant have been several studies coming out of Australia which bear on composition, origin, and utilization of coal seams (for example, Marshall and Draycott, Fuel, vol. 33, pp. 26-41, 1954 on the effects of oxidation on carbonization; and Marshall, Fuel, vol. 33, pp. 134-144, 1954, on the composition and origin of fusain).

The Mexican Government, through the geologic staff of the Bank of Mexico (Banco de Mexico), has been studying the reserves of lignite in south central Mexico, near Oaxaca. These coals are essentially lignites (Toron and Cortes-Obregon, Mining Eng., vol. 6, pp. 505-509, 1954). They may be of little importance now but offer a reserve of considerable promise to a country whose chief coals lie near its northern border, far away.

A most significant element touching both mining geology (which, as a tool, aided greatly in the exploration required) and mineral economics



Development of iron ore discoveries in Venezuela place South America at least second in World iron reserves

has been the swift expansion of the U. S. S. R. as a coal producing nation, to a position second only to that of the United States (J. D. A. Morrow, Mining Eng., vol. 6, pp. 45-48, 1954).

Systematic Exploration

A description of how the Pima, Ariz., copper deposit was discovered by geophysics, following an appraisal of basic geologic factors, was given in the Mining World, October, pp. 42-45, 1954. This discovery was the result of a planned exploration program based on the fullest use of the literature and the latest geophysical methods. While the program required several years and involved expenditures of apparently substantial sums before any worthwhile results were obtained, it illustrates what can be done with patience, industry, and skill.



As a result of \$10,000,000 expenditures for exploration alone, 417,000,000 tons of iron ore were blocked out in Labrador

Valuable adjunct tools are, of course, in any of the fields of geology, geophysics and geochemistry. Several of the larger companies today are maintaining geophysical, geochemical, aerial photographic, and other research.

Who Finds the Mines

The widespread publicity given to Vernon J. Pick and Charles A. Steen, discoverers of important uranium deposits on the Colorado Plateau, serves to emphasize that it is the prospector on foot who remains responsible for the discovery of most of the new mines.

On the basis of statistics it can be shown that the prospector, often it must be admitted, armed with government maps and other data, still more than holds his own in mineral discoveries as compared with the scientist with all the most up-to-date equipment. The prospector of today, however, is very different from the old-time version. He selects his restricted area for prospecting from government maps and other data. While the difference in the field between a skilled prospector and a field geologist is not great, it is still the man on foot who makes most discoveries and it is probable that he will do so on this continent for some time to come, especially when the tar-

get is a small, precious metal deposit.

Recent discoveries in Canada, statistically considered, will serve as an example. There were three important discoveries in Canada during 1954. Two of these—the copper deposits just west of Ungava Bay in New Quebec (Fenimore Iron Mines) and those near Tashota in Ontario (Teck-Hughes Gold Mines) were made by prospectors on foot, while the base metal deposit being developed in New Brunswick (The American Metal Co., Ltd.) was found by the American Metal Co. and the International Nickel Co. by airborne geochemical methods.

The Annual Review of the Northern Miner (Toronto), November 25, 1954, carries an article entitled "Where do the new mines come from?" According to this article, in the last ten years 77 ore bodies in Canada have been brought into production, some of which were found before World War II. Of these, 46 (60 percent) are rated as new mines which were discovered as follows:

Prospecting	47 percent
*Diamond drilling	38 percent
Geophysics	15 percent

Forty percent of these new producers, or 31 cases, represent the re-opening

* Diamond drilling as here used includes only exploration below overburden or along a favorable geologic belt.

of old mines. Of these, 56 percent were base metal mines, reflecting a change in the value of the metals as a result of fluctuations in prices.

Since the end of World War II, 30 mines have been found and brought into production, according to these data. The discoveries were made in the following ways:

Prospecting	53.3 percent
Diamond drilling	28.3 percent
Geophysics	18.3 percent

Such figures suggest that, despite the advances in geophysics and geochemistry, the foot prospector, whether geological or untutored, has increased his lead by seven percent. Of the 30 new mines, 36 percent are for base metal; 20 percent for gold (even in a depression era for the precious metal!); and 20 percent for uranium.

It is to be hoped that the man on foot can be better supplied with tools as basic research gathers momentum and continues. Favorable signs are the increasing attention given to the geochemistry of transport and deposition of the ions and minerals sought—in brief, questions of their genesis (for example, such work as that of Ingerson, Econ. Geol., vol. 49, pp. 727-733, and of F. G. Smith, ibid., pp. 530-536). Only a better understanding can furnish better tools for the prospector!

Coal Research

(Continued from page 98)

ing blending of coals on a semi-industrial scale. In an associated study, they are producing pulverized semi-coke beginning with coals with a high-volatile matter content; this char is incorporated in coking batches as a replacement for semi-fat coals. In addition, they are conducting work on agglomerated semi-coke for use as a domestic fuel produced in a two-phase distillation process—the first in externally heated cells of thin metal, and the second in a tank heated by recycling gas and air, with partial combustion.

Germany

Considerable increase in coal research has been noted in Germany; the research covers mining and preparation, gasification, and coal utilization. Rapid fluctuations in the coal and coke market and the competition from other fuels have made the German coal industry more research minded than before. As a result, the mining industry has decided to build a major research center at Essen during the next two or three years.

In the mining and preparation fields, most of the development work has been on improving existing equipment and expanding its use, rather

than on the invention of new types.

In the field of coal chemicals, a semi-technical scale pilot plant is being built for oxidation of bituminous coal followed by the activation of the products to produce activated carbon as a substitute for charcoal. In a second pilot plant, oxidation by nitric acid will be studied on a larger scale. Experiences gained from coal oxidation will be applied to oxydizing certain hydrocarbons. Germany reports significant progress in work at the Max-Planck Institute for coal research on the production of polyethylenes of any desired weight, far beyond the range of hitherto obtained molecular weights. It is expected that this work will be used in developing processes which will open new fields in coal- and petro-chemicals.

In coal gasification, a large-scale gasification plant for making pipeline gas from caking bituminous coals is being constructed, and a full-scale experimental pulverized-coal gasification plant has been operated successfully. Long-run experience is now being gained on the pulverized-coal gasification plant to simplify the process and establish equipment life.

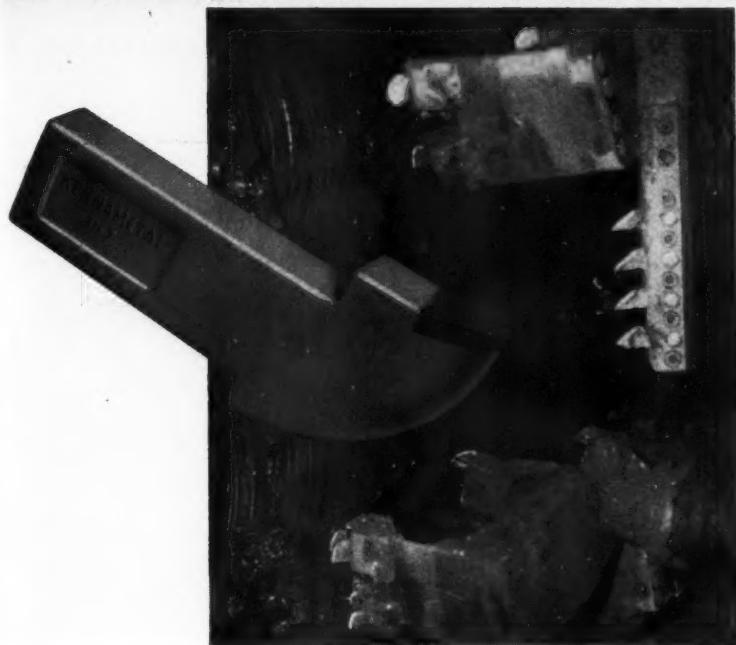
South Africa

Most of the information on South African coal research for this article came from the Fuel Research Institute of South Africa. This group is

continuously studying the physical and chemical properties of that area's coal resources. Currently, studies of the reaction between oxygen and carbon are under way. As a result of the Institute's investigations of weathering and slacking characteristics, it reports that reasonably accurate predictions concerning the behavior of coal in storage can be made on the basis of thermal behavior of the coal in laboratory experiments. The Institute is not doing research in mining operations but is giving great attention to all phases of preparation.

In research whose objective is the improved use of coal as a fuel, the Institute is studying the effects of moisture and size and the fluctuations of these properties on the performance of chain grate stokers. It is investigating the formation and composition of external boiler deposits and the influence of fuel, operating conditions, and design of equipment on these deposits.

Although well supplied with coal, South Africa has small supplies of coking coal. For this reason, they are studying seams to discover what portions can be selectively mined for coking coal; lighter fractions of finer coal from seams which are non-coking are being studied as a source of coking coal. In associated studies they are conducting research to improve quality of coke from beehive ovens.



KENNAMETAL* U-7's help pioneer continuous mining in Indiana

... give 40% lower bit cost at Enoco Collieries

Enoco Collieries No. 5 seam is known as a "toughie" in Indiana. Until recently this six-foot, boulder-ridden measure was considered economically impractical to mine with continuous machines due to high bit cost.

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Their lowest bit cost per ton—40 percent lower than that of any other tooling used—was achieved using Kennametal U-7 Bits. These bits had a 20-degree rake angle recommended by Enoco's general superintendent, John Stachura. They increased penetration speeds in solid work up to 15 inches per minute, in recovery work up to 28 inches per minute . . . *an average of better than three inches per minute over speeds achieved with other carbide tools tested.*

A recent operating report showed an average weekly production of 365 tons, or approximately 45 tons per man at the face.

This is not an isolated case. Kennametal is increasing productivity and lowering bit cost per ton wherever it is used. The next time you buy, be sure to specify Kennametal. *It will cost you less in the long run.* KENNAMETAL, INC., Bedford, Pa.



Proper application important

The two bits shown above were originally identical. They were used in the same machine for drilling the same material . . . hard sandstone. Operating at low torque and high rpm, the bit on the right drilled four inches before it was removed. It was not reusable. Compare it with the bit on the left which drilled six feet in this material, but at high torque and low rpm. This bit is just now in need of reconditioning. The difference was in the application of the tools. Your Kennametal representative is a specialist in proper tool application. Let him help you achieve best performance.

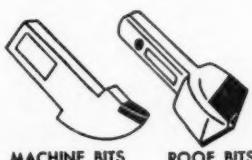


Reconditioning—when and how

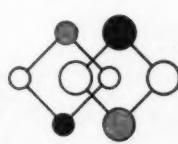
Proper bit reconditioning and changing intervals are very important, if not essential, to lowest bit cost. As a guide to setting up procedures for grinding your own tools, or judging if commercial grinding is being done properly, Kennametal offers you a comprehensive, new booklet entitled, "The When and How of Reconditioning Kennametal Bits." Write for a copy.

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BT24



MACHINE BITS



ROOF BITS

INDUSTRY AND
KENNAMETAL
...Partners in Progress



DRILL BITS ROCK BITS



Briquettes of rutile and carbon are made in rotary furnace and later chlorinated to form titanium tetrachloride

Titanium

**Metal Production Doubles Again as Industry Tries to
Keep Pace With Demand**

By E. R. ROWLEY

President
Titanium Metals Corporation of America

TITANIUM metal is very new, first getting into commercial production about 1948. The 1954 output of this metal approximated 5000 tons. This will more than double 1953's output, which doubled 1952's, and it is expected to double again in 1955.

The tonnage value of the 1954 output will approximate \$50,000,000, based on a selling price just under \$5.00 per lb. The properties that make people want to pay \$5.00 a pound are its high strength with light weight, and its corrosion resistance. Although it is a young metal, alloys have been developed with 180,000 pounds tensile, weighing 56 percent of alloy steel. It is practically unaffected by sea water and many other corrosive elements.

Its major use, and the one which has emphasized and helped its development, is in the jet engine and in the airframe of modern, highspeed aircraft. It is also going into the chemical industry, and its future, of course, is greater there.

The first commercial process for the production of titanium was that de-

veloped by William Kroll, a Luxemburger, in 1940. It consisted of the reduction of titanium tetrachloride with magnesium under an inert atmosphere and under a positive pressure. It is a process used by the two active American producers, Titanium Metals Corp. of America and E. I. du Pont de Nemours and Co. It produced the first ductile metal, and without the ductility of titanium, there was no use found for it earlier.

Titanium occurs as one of the four most prevalent structural metals in the earth's crust, following iron, aluminum, and magnesium, so there will apparently be no lack of titanium for the metal tonnages that we talk about for the foreseeable future. There are two major ores of titanium; ilmenite, of which about 900,000 tons a year are produced worldwide, and rutile, of which 40,000 to 50,000 tons are produced each year. Now, most of those ores go into the manufacture of titanium dioxide for use in paint pigments and other chemical products.

There are massive ilmenite deposits being worked now at Lake Allard,

Quebec by Kennecott, at McIntyre, N. Y. by National Lead Co., and in Norway, also by National Lead Co. Much ilmenite is produced on the beaches of India, and on the old beaches of the southeast coast of the United States. Rutile comes largely from Australia, with some production on the southeast coast of the United States also. The future of any large scale development of titanium metal will lie in ilmenite rather than in rutile.

The titanium program has grown very rapidly. There are now the two producers mentioned, each with a capacity of 3600 tons—Titanium Metals at Henderson, Nev. and Du Pont at Newport, Del. Military requirements for titanium are in the order of 35,000 tons per year, against production of 5000 tons. To meet that requirement of 35,000 tons, other plants are coming into being now. Cramet, a subsidiary of Crane Co., is building a plant at Chattanooga, Tenn. with a capacity of 6000 tons per year, due in full production in 1955. Dow is building a plant with a capacity of 1800 tons per year, due in 1956.

Last fall the Electro Metallurgical Co. announced it would build a plant at Ashtabula, Ohio, with a capacity of 7500 tons of metal per year due in full capacity in 1957. This will be the first American plant to use a process other than the basic Kroll process. It will reduce titanium tetrachloride with sodium, rather than with magnesium.

Those total capacities come to 22,500 tons per year, still short of the 35,000 tons required by the military.

To meet part of this deficit, Du Pont is engineering a plant sized in the order of 7000 to 8000 tons to be built at Nashville.

Fabricating of titanium metal in the United States into the semi-finished product is done by four concerns—Titanium Metals Corp. of America, a combination of National Lead and Allegheny Ludlum Steel; Rem-Cru Titanium, a combination of Remington Arms and Crucible Steel; Mallory-Sharon Titanium, a combination of P. R. Mallory and Sharon Steel; and the Republic Steel Corp. It is of interest to note that all four of these converters are associated with steel companies.

Of course, with the tonnage on the order of five, ten, fifteen and 35,000 tons talked about for the near future it would be economic suicide to build converting equipment. As a result, everybody is working with steel companies who already have heavy duty equipment which will fabricate titanium. With material having on the order of 150,000 psi tensile or yield strength, some pretty heavy equipment is required to work the metal.

There is one foreign producer of titanium coming into being in Europe. Imperial Chemical Industries is finishing up a 1500 ton per year plant to be completed this year. It will use sodium as reducing agent and reduce titanium tetrachloride. In Japan there is capacity of about 600 tons per year scattered among a number of producers, all using the Kroll process.

Titanium has a bright future. It is a necessity in high speed military aircraft. As Senator Malone has so aptly put it, the second best airforce is like the second best poker hand,

and the high speed aircraft of today need titanium.

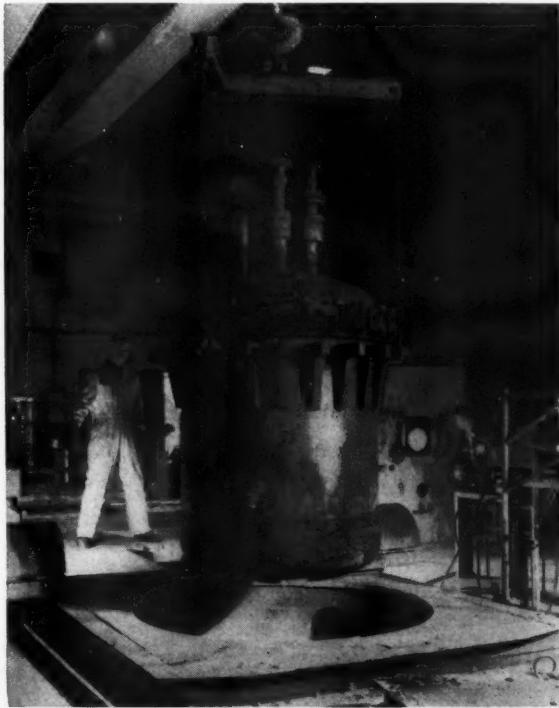
Its price will come down as knowledge and experience increase and its market will broaden, as a result.

Editor's Note: The major portion of titanium ore mined is not processed into titanium metal but is used as an industrial mineral in manufacture of paint pigment, ceramics, etc. Dr. Joseph L. Gillson, Development Dept., E. I. du Pont de Nemours & Co., Inc., reviews below the latest developments in that field.

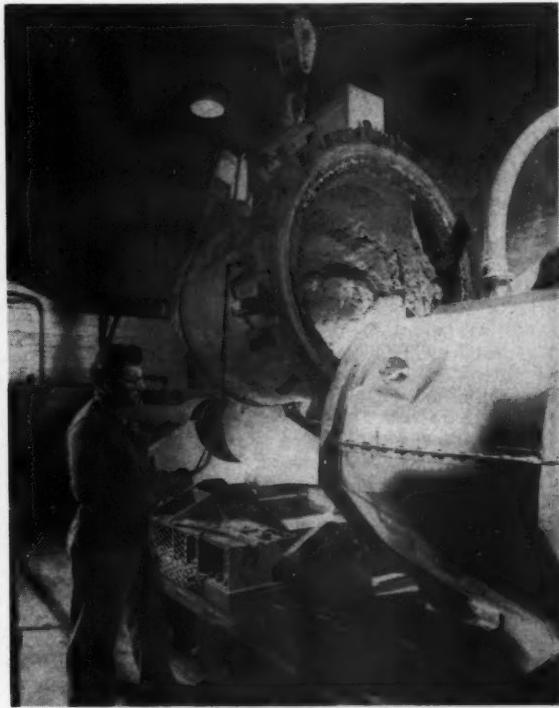
THE GLAMOR of titanium metal has stimulated a great deal of current activity in the search for and development of titanium deposits. The principal ores are: rock ores containing ilmenite, used with or without mechanical concentration; sand ores containing ilmenite analyzing from 50 to 63 percent TiO_2 ; rock ores containing rutile and sand ores containing rutile, leucoxene, and altered ilmenite. The two largest examples of rock ores in North America in active production are the Sanford Hill deposit at Tahawus, N. Y., worked by the National Lead Co., and the Allard Lake Deposit

north of Havre St. Pierre in Eastern Quebec, worked by the Quebec Iron and Titanium Co.

An ilmenite concentrate analyzing about 45 percent TiO_2 is produced by ore dressing methods at Tahawus, and is used in the manufacture of pigment by the sulfate process. The Allard Lake ore which is an intimate mixture of ilmenite-hematite is not concentrated except by selective elimination of horses of rock in mining, and is smelted at Sorel, Quebec, to make pig iron and a titaniferous slag, assaying 73 percent TiO_2 . The slag is an excellent raw material for pigment manufacture by the sulfate process, but has not yet been used commercially in chlorination to make $TiCl_4$ (which is the first step in metal manufacture), because of the content of Ca, Al, Mg, etc., the chlorides of which are not volatile, and are hard to handle in the plant. The long known Norwegian rock ore is shipped to Germany for manufacture of pigment. A number of other rock ores have been investigated, as, for example, that at Iron Mountain, Wyo., by the Union Pacific Railroad, and many other large ones are known. A recent discovery in Egypt, at Abu Ghalku, was described in the January 1954 issue



Titanium tetrachloride and magnesium will be introduced into this reactor pot after it has been lowered into furnace



Titanium sponge is removed from reactor pot, ground and leached to remove impurities, and melted into titanium ingot

of *Economic Geology*. Since these rock ores must be smelted to yield a high quality titaniferous slag, near future development of one or more is deterred by the tremendous investment required for such plants.

Ilmenite sand ores vary from deposits with ilmenite analyzing 60 to 63 percent TiO_2 , down to others with about 50 percent TiO_2 . An excellent study by the research laboratory of the National Lead Co., published in the August 1954 issue of *Mining Engineering*, explains the reason for the variation. The ilmenites high in TiO_2 have been weathered, and much of the iron leached out. The outstanding examples of high grade sand ilmenites are those from Travancore, and from Florida. A very large amount of the total titanium pigment produced is made from these two sources of ilmenite. Deposits containing ilmenites lower in TiO_2 are very numerous, and although serious attempts are being made to exploit them, they are unattractive to pigment manufacturers to whom the higher grade ilmenites are readily available. For example, the monazite dredging near Cascade, Idaho, is yielding large tonnages of an ilmenite assaying about 50 percent TiO_2 which is not worth shipping costs. An exception is the deposit at Umgababa, near Durban, South Africa, which is being brought into production, for local consumption. Results of exploration of that deposit were described in the February 1954 issue of the *Mining Magazine*. The deposit contains 2,000,000 long tons of ilmenite, 170,000 tons of rutile, and 273,000 tons of zircon. Another deposit on the east coast of South Africa has been found at Morgan Bay. A deposit containing ilmenite of intermediate grade has been discovered in Gambia. British Titan Products Co., Ltd., has made a 30-year agreement with the government of Gambia, and is preparing to mine the sands for shipment to England. Capital expenditure by the company for plant and equipment will be about £1,250,000. During the year a great deal of activity was displayed in a deposit of sands on the east coast of Ceylon. The ilmenite in this sand carries about 54 percent TiO_2 but the sand does contain rutile, and should be considered only as a reserve for that mineral. The government of Ceylon invited tenders from potential producers, but demanded a very high royalty. Although it was announced in the press that a tender had been accepted, it was learned later that an insufficient guarantee had accompanied the tender.

A number of deposits of sands carrying an ilmenite analyzing 50 to 54 percent TiO_2 are known on the Atlantic Seaboard, and the U. S. Bureau of Mines announced the discovery of another at Hilton Head Island, S. C.,

which appears to be of substantial size. Stock in a company to produce ilmenite at Cove Point, on the west side of Chesapeake Bay, south of Washington, was offered for public sale during the year and an exploration of the sands under Chesapeake Bay was under way toward the end of the year.

Rock Ore Deposits

Rock ores carrying rutile in workable quantity are rare, and operations of the American Rutile Co. in Virginia have been shut down for several years. Exploration of a rock deposit at Pluma Hidalgo, in the State of Oaxaca, by the Republic Steel Co. has received a great deal of publicity. Many companies had examined the deposit, but were deterred by the obvious high cost of exploration in the rough and inaccessible locality, but Republic has had a field party there for two years and has proven the existence of a substantial tonnage. The deposit lies at an elevation of about 4000 ft, 30 miles north of the Pacific Coast port of Puerto Angel. The ore occurs in shoots or zones in a pegmatite or granitized schist, and will require underground mining. Production is at least two years away. The reserve is cited as being 15,000,000 to 25,000,000 tons of crude ore, assaying 15 percent TiO_2 . This statement would indicate recoverable rutile in quantities of 2,000,000 to 3,500,000 tons.

Sand ores carrying rutile or leucoxene are widely known, but in few is the percentage of rutile sufficient for the sand to be worked for that mineral alone. Rutile is produced at the operation of the National Lead Co. east of Jacksonville, Fla. A non-magnetic "residue" is produced at the Trail Ridge operation of the du Pont Co., and is used for the manufacture of $TiCl_4$ at its Edge Moor, Del., plant, from which both pigment and metal are made. The principal source of rutile, however, is Australia, and the operators there have had an exceptionally busy season. Eleven companies are working, four in Queensland, and seven south of the state border in New South Wales. The reserves are quoted as follows: rutile 754,000 long tons, zircon 970,000 tons, ilmenite 662,000 tons (this ilmenite is high in chromium and has not been marketed to date), and monazite 12,500 tons. Current production is at the rate of about 40,000 tons per year. Titanium and Zirconium Industries Pty., Ltd., a subsidiary of the Zinc Corp., is considering working the low grade dune sands of Stradbroke Island on a large scale.

Plant Expansions

Other items of interest are as follows: E. I. du Pont de Nemours & Co. is preparing to double its opera-

tion in Florida, and has been building a plant near Lawtey, which is an approximate duplicate of that at Starke, nine miles south. This will be in operation early in January 1955. The Humphreys Gold Corp. acts as the contractor, both in plant construction and in operation. The Crane Co. has been prospecting on the Gulf Coast of Florida, west of Panama City, and is reported to have discovered a deposit in the Seagrove Beach area between Panama City and Destin, which is at the mouth of Choctowhatchee Bay. Crane is interested also in a development in the Savannah River, a few miles south of Augusta, Ga., where a dredge is being installed. The Florida Ore Processing Co. is continuing to work a "storm line" deposit on the outer beach, near Melbourne, Fla. Bear Creek Mining Corp., a subsidiary of Kennecott Copper Corp., has been prospecting in northeastern Florida, but a company called Nuclear Magnetic Mining Co. has been refused prospecting rights in Anastasia State Park. Du Pont has acquired about 2000 acres of land northeast of Folkston, Ga., where drilling has disclosed a shallow deposit of titaniferous minerals.

Deposits supposed to be of anatase on several islands in Hawaii were investigated during the year and found to be of marginal interest.

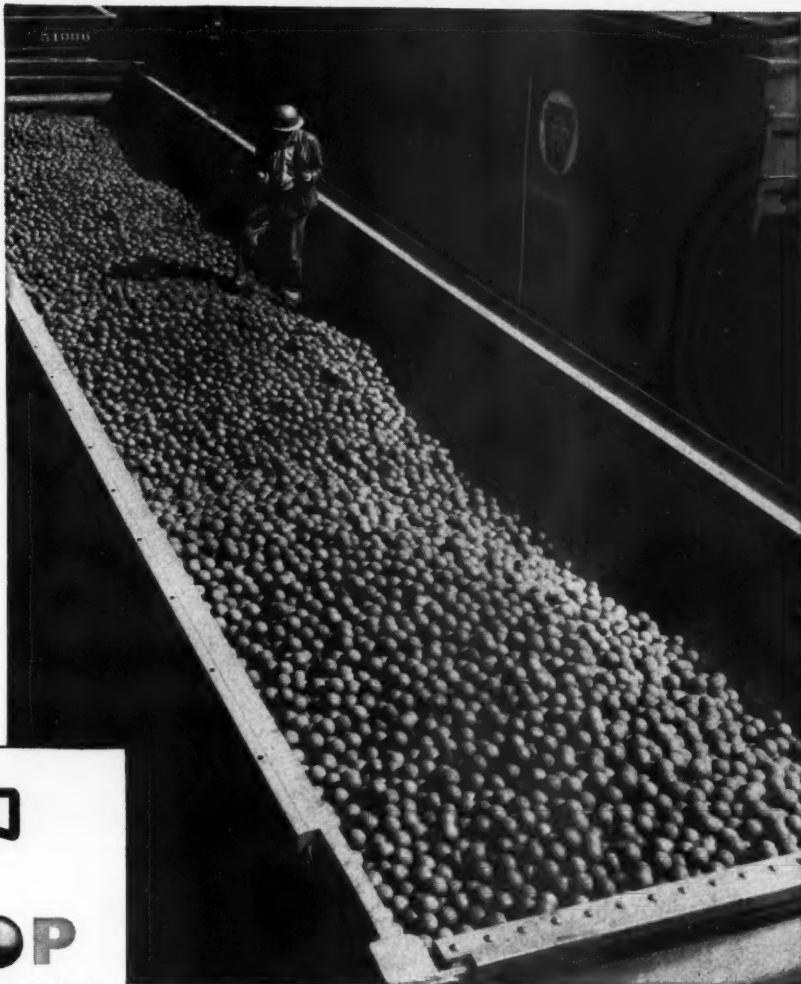
Travancore, India, ilmenite continued in good demand, and the price was increased to 75 shillings per long ton, before loading. The undefined policies of the State and Central Governments have served to limit the normal growth of the industry, and has made consumers wary of increasing dependence upon the Indian source. The government-owned pigment plant has resumed operations. The central government loaned the local firm 1,500,000 rupees. Capacity is about 1800 tons per year.

The Quebec Iron and Titanium Corp. mined, crushed and shipped, from its Lac Tio orebody, 270,000 gross tons of ilmenite ore containing 88.7 percent combined titanium and iron oxide during 1954. Approximately 106,000 gross tons of titanium dioxide slag, containing 70 percent equivalent TiO_2 , were produced and shipped during this period.

The smelting operation at Sorel was maintained at a reduced level during the year in order that an intensive development program could be carried out. As a result of this program certain modifications are being made to the electric furnaces, and the decision was made to install ore beneficiating facilities.

Most of the slag produced was exported to the United States for the titanium pigment industry. Small lots were again shipped to various chemical industries for experimental work in chlorination and metal production.

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Coal-Mine Safety During 1954



Following an all-time low in 1953, the 1954 fatality rates increased to 1.01 fatalities per million man-hours

Fatality Rate Up as Industry Launches National Accident Prevention Campaign

By M. J. ANKENY

Safety Director
Bituminous Coal Operators' Association

THE year 1954 saw a sharp upturn in fatality rates in the coal-mining industry as compared to the low rates of 1952 and 1953, when lowest fatality records in the history of the industry were established. The following table showing the trend in coal-mine fatality rates from 1950 to and including 1954 indicates that in 1952 the combined anthracite and bituminous rate was 0.85 fatalities per million man-hours worked; in 1953 the rate was reduced to 0.84, an all-time low, while in 1954 the rate went up to 1.01.

One Major Disaster

A most disconcerting and baffling development in coal-mine safety during 1954 was the major coal-mine explosion that occurred in the Jamison No. 9 mine at Farmington, W. Va., on November 12, 1954, taking the lives of 16 men. This disaster was a shock not only to the mine management, the

dependent survivors of the deceased, and the surviving employees of the mine, but also to safety-minded coal-mining men everywhere. It was a shock because the Jamison No. 9 mine was known to be one of the best managed, best engineered, best equipped and best safeguarded mines in the United States. While the Federal standard for rock dusting requires the maintenance of 65 percent incombustible matter in the mine dust, the usual standard maintained in this mine was 90 percent or better. Not only was the mine in complete compliance with Federal requirements for rock dusting active workings and entries, but these requirements were exceeded greatly by the rock dusting of all accessible, mined-out, pillared areas. The most modern and foolproof system of ventilation was employed in this mine. Overcasts were used throughout the mine to control the ventilation instead of conventional mine doors which always constitute a potential air-short-circulating hazard where they are used. A complete and practical bleeder system was in effect. Only well maintained permissible equipment and permissible blasting methods were used in the face areas. A rigid system of pre-shift and on-shift examinations for

ble matter in the mine dust, the usual standard maintained in this mine was 90 percent or better. Not only was the mine in complete compliance with Federal requirements for rock dusting active workings and entries, but these requirements were exceeded greatly by the rock dusting of all accessible, mined-out, pillared areas. The most modern and foolproof system of ventilation was employed in this mine. Overcasts were used throughout the mine to control the ventilation instead of conventional mine doors which always constitute a potential air-short-circulating hazard where they are used. A complete and practical bleeder system was in effect. Only well maintained permissible equipment and permissible blasting methods were used in the face areas. A rigid system of pre-shift and on-shift examinations for

TREND IN NATIONAL COAL-MINE FATALITY RATES

Period Calendar Year	Bituminous Fatalities	Rate*	Anthracite Fatalities	Rate*	Total Fatalities	Rate*
1950	550	0.92	93	0.80	643	0.90
1951	685	1.08	100	0.94	785	1.06
1952	449	0.83	99	0.99	548	0.85
1953	396**	0.84**	64**	0.91**	460**	0.84**
1954	333**	0.98**	62**	1.20**	395**	1.01**

* Number of fatalities per million man-hours.

** Estimated.

explosive gas and other hazards was maintained not only on working days but also on days when the mine was not producing coal.

The explosion occurred on an idle day at 1:45 p. m., just 15 min before several maintenance men and supervising officials who were in the mine were expected to be at the shaft bottom at the end of their shift. It is presumed that they were on their way to the bottom at the time of the explosion. The violence of the explosion at the collar of the portal shaft was so severe that the steel headframe was destroyed and several surface buildings were also destroyed or damaged. A man in one of the surface buildings was killed. After the initial explosion there were other explosions at recurring intervals. Dense clouds of smoke at the upcasts indicated that the explosion had set fire to the coal and the recurring explosions indicated that the mine was afire probably in many places. Conditions were so bad that all attempts at rescue and recovery operations were given up and, after careful deliberation by the management, Federal and state authorities, and union representatives, it was decided to seal the mine at the portals.

No one knows what caused this explosion and the cause will not be known until the fire is extinguished and the mine is unsealed and recovered. But this much is certain—when the cause is known it will not be the usual cause ascribed to mine disasters such as too much coal dust, not enough rock dust, defective or deficient ventilation, lack of vigilance on the part of management or the inspection agencies. There is every reason to believe that when the cause of this disaster becomes known it will be something outside the usual hazards of the industry.

While the record was marred by the major mine disaster of November 12, the industry can take pride in the fact

that mine disasters are becoming far less frequent in recent years. The disaster of November 12 interrupted a period of approximately 33½ months without a major explosion disaster, with the exception of an explosion in Iowa in 1953 in which two men were killed directly by the explosion and three other unauthorized persons entering the mine after the explosion were killed by afterdamp. The longest previous period that the industry ever operated without a major disaster was from November 4, 1948, to January 18, 1951, approximately 26 months. These extended disaster-free periods indicate that the industry is learning to control the potential hazards of gas and dust in coal mines and give rise to the hope and expectation that the time will come when the industry will be free from such occurrences.

USBM Reorganization

A significant and important development in 1954 was the reorganization of the U. S. Bureau of Mines, carried into effect by the Secretary of the Interior at the close of the year as a result of recommendations of a survey team made up of persons from private industry appointed by the Secretary on November 30, 1953.

The most noteworthy change affecting the health and safety work of the Bureau was the removal of all health and safety activities, including coal-mine inspections, from the operational control of the various Regional Directors and centralizing this control in Washington under the newly created position of Assistant Director for Health, Safety and Coal-Mine Inspection. Now that the new organization has been established, it is anticipated that the remaining recommendations of the survey team relative to health and safety will be carried into

effect without undue delay. These recommendations provide that a major effort of the Bureau shall be directed to educational work; that co-operation with State mine inspection departments, miners and operators be increased; that changes in the interpretations of the Safety Code by the Bureau be made available to the miners and management before being put into effect; that the Bureau look into the possibility of limiting the frequency of inspections in accordance with the safety conditions at the mine; that a written examination on mining safety practices and methods be employed in qualifying inspectors for appointment; that the present form of inspection reports be revised for the purpose of simplification; and that an advisory committee be established and regularly consulted in connection with the functions of the Bureau with respect to mine health and safety matters.

Cooperation at the National Level

For the first time in the history of the coal-mining industry there has been developed during 1954 a close working relationship between officials of the U. S. Bureau of Mines who are responsible for the administration of the health and safety activities of the Bureau, including coal-mine inspection activities, safety representatives of the coal operators associations headquartered in Washington, and safety representatives of the United Mine Workers of America. Through this working relationship the safety problems of the industry, particularly those related to the administration of Public Law 552 and the Federal Mine Safety Code, are discussed openly and frankly at informal meetings, called sometimes by the Director of the Bureau and sometimes at the request of the industry or labor safety representatives. These informal meetings provide an opportunity for the industry to present its views concerning the Bureau's conduct of its safety responsibilities and an opportunity for the Bureau to get across to the industry its ideas concerning the promotion of safety in coal mines. The effect of this informal arrangement is to create a better understanding of the industry's safety problems and of the problems inherent in the administration of the Federal Law and the Safety Code.

A recent outgrowth of this activity has been the launching of the 1955 National Accident Prevention Campaign pointed toward the reduction of accidents from falls of roof and coal through an industry-wide educational effort. The campaign will concentrate on the prevention of accidents from falls of roof and coal because these are responsible for more accidental deaths in coal mines than all other causes combined.



Interest in safety education increased and many mines completed 100 percent training program in the U. S. Bureau of Mines' Accident Prevention Course for Coal Miners

Two Major Research Projects

Working closely with industry and labor the U. S. Bureau of Mines has undertaken two major research problems during 1954. Each of these projects was near completion at the close of the year. One project consists of a study to establish testing specifications for fire-resistant mine haulage belts with a view to including mine belts in the permissibility system of the Bureau. Once the testing requirements for fire resistant belts are determined, and an appropriate testing schedule adopted, a belt manufacturer may submit a sample of his product to the Bureau for fire resistivity tests. If the belt meets the adopted standards the manufacturer will be permitted to indicate by means of a label on his product that the belt is approved by the Bureau of Mines for fire resistivity.

Another project of major importance is a study of preparation plant hazards with special reference to possible explosion hazards associated with thermal drying units in cleaning plants. These studies were initiated as a result of several explosions and "puff backs" in such plants with a view to determining the need for possible changes in construction of such plants and with a view to establishing standards of safe operation. Any standards developed as a result of these studies will be offered to the industry as recommendations. It is anticipated that the results of these studies will be available early in 1955.

Frame Grounding

Grounding the frames of electric equipment to prevent electric shock should a fault to ground develop within the machine has long been recognized as an appropriate safety measure. This precaution, when applied to stationary equipment, has presented no difficulties, but when applied to off-track equipment has been found to be somewhat impractical. Accordingly the U. S. Bureau of Mines has been devoting much of its energy and resources toward the development of suitable measures to afford equivalent and at the same time practical protection. Current thinking on this subject runs to the adoption of a polarized relay system, or a polarized short-circuiting device, or some electronic device which would enable the negative power conductor to be utilized as the grounding medium. Several such devices have been developed and tested in the laboratory and found, in theory at least, to be feasible. The Bureau in cooperation with mining companies and manufacturers is now conducting practical field tests of this equipment in mines. While no such device has yet been approved by the Bureau, early adoption is indicated of one or

more methods of ground fault protection as a substitute for a third conductor in trailing cables. It is anticipated that these devices, if and when approved by the Bureau, will be acceptable in lieu of three-conductor cables on permissible electric face equipment.

Study Natural Gas Storage

One of the notable developments in coal-mine safety during 1954 was the growing recognition by the industry of the hazards incidental to the storage of natural gas in the depleted gas sands underlying active coal mines. Development of underground gas storage reservoirs dates back to 1916, but the greatest progress has been during the past 10 years. There are storage pools in 17 states. In the Appalachian region alone there are 101 storage pools with a combined capacity exceeding 526 billion cu ft. Uncharted wells and improperly plugged, or improperly cased, wells present the greatest hazard to coal mining because mining operations may intersect uncharted or defective wells and release great volumes of gas under high pressure into the mine workings. There is no known practical mining ventilation procedure or method that could cope with such a situation.

Growing recognition of the problem by the coal mining industry is evident by the study that has been given it by eminent mining engineers. In addition the industry has opposed in a concerted and organized manner the passage of Federal legislation amending the Natural Gas Act to give the gas companies the right of eminent domain to acquire storage rights in gas sands underlying coal properties. Positive action on the part of coal mining industry representatives prevented the passage of this legislation in the 83rd Congress and it is almost certain that if such rights are eventually granted by Congress they will be highly restrictive. Currently a great amount of effort is being made in Pennsylvania and other major coal producing states to secure adequate state legislation to bring about a regulated control of the potential hazard of underground gas storage reservoirs.

Dust Control

Widespread increase in roof bolting and in the use of continuous mining machines has introduced new problems of dust control. An important step toward meeting the problem of dust control in conjunction with continuous miners was taken by a mining company in western Pennsylvania by developing the use of auxiliary exhaust fans for face ventilation. The fans are usually located in the last open crosscut with rigid tubing extended to a point near the face. With this arrangement uncontaminated mine air is drawn over the workmen and after

being contaminated by the continuous mining and roof drilling operations it is discharged directly into the return airways. Rock dust is concurrently blown into the return airways to keep the incombustible content of the deposited dust up to the required standard.

While the use of small auxiliary fans for face ventilation is generally frowned upon by coal-mine inspection agencies and is, in general, prohibited by the Federal Mine Safety Code, the particular installation referred to has been approved by the Pennsylvania Department of Mines and the Joint Industry Safety Committee. There is every reason to believe that the use of these small auxiliary fans, operated exhausting, plus the copious use of water sprays on the machines, is the best approach that has been made to the problem of dust control in continuous mining operations.

Considerable progress in the development of drill-dust collectors was evidenced by the fact that seven new approvals were recently granted by the U. S. Bureau of Mines on new drill-dust collectors for use in connection with rock drilling in coal mines and seven extensions of approvals were granted to cover modifications in previously approved equipment.

One of the seven new approvals was granted for a combination dust-collecting unit consisting of the "Holman Dryduct" drill (British) in which dust is drawn through the hollow drill steel into the collector instead of the conventional method of collecting the dust as it emerges from the collar of a drill hole.

Other Developments

Interest in safety-education activities has been on the increase during the past year. The training of all employees in the Bureau's Accident Prevention Course for Coal Miners at a substantial number of large mines has been made possible through close cooperation of district and local union officials of the United Mine Workers of America and local mine management officials. There has also been increased interest and activity in the organization of local safety chapters and district safety councils of the Holmes Safety Association. During the year the Bureau of Mines determined to put forth greater effort toward the extension of Holmes Safety Association activities and in May 1954 a group of Federal inspectors from the various coal-mining areas throughout the United States was called to Washington for a training course in organizing Holmes Safety Councils and Chapters. Since then, these inspectors have been devoting full time to such activities in their assigned areas and they are available upon call to assist the industry in any area in the promotion of this work.



Inspiration remodeled its crushing plant

Mineral Dressing

Outlook at Year's End Is for Greater Output As Expansion Programs Are Completed and New Equipment Proves Itself

AS 1954 drew to a close, prices of non-ferrous metals showed unmistakable strength, due to the Government's new long-term stockpiling objectives, and the steel industry was climbing back up out of the doldrums of mid-year. These facts and the consensus that industry in general is due for a better year in 1955 have done much to encourage the mining industry. As a result, the vital field of mineral dressing, along with all mining, has received a definite shot in the arm and is looking forward to producing increased tonnages in the months ahead. Many companies, which had begun expansion programs in the last two or three years, pushed them through to completion, or near completion, in 1954.

New Capacity Planned

There were many noteworthy additions to productive capacity during the year with new plants coming into production, old plants increasing their output and plans announced for additional new facilities to be constructed. Among those that received notice in the daily and technical press was the

opening of the world's largest asbestos mill by Johns-Manville at Asbestos, Quebec. This mill will have a production capacity of 625,000 tons annually by 1956. Johns-Manville also opened two asbestos mines and a mill in Southern Rhodesia. The mill has a capacity of 25,000 tons of asbestos fiber annually. It was also announced that American Smelting & Refining Co. would start a \$20,000,000 expenditure at Black Lake, Quebec, for the production of asbestos.

One of the first noteworthy events in the field of copper production was the successful moving of all mining and milling equipment from Castle Dome to Copper Cities. The Castle Dome mill shut down on December 5, 1953, and the equipment to handle 12,000 tpd of ore was moved 15 miles to its new location by January 18. Copper Cities Mining Co. started production later in the year.

In April the Silver Bell concentrator went into production following test runs. It will produce 18,000 tons of copper annually. Crushing is standard in three stages. Grinding is single stage in 10½ by 12-ft mills. Sil-

ver Bell has been called the "mill of the year" because of the labor and cost saving features in its design.

Phelps-Dodge's Lavender Pit started production in August. The mill here has a 48-in. gyratory crusher and shorthead cones to produce minus ½-in. product. The grinding circuit is single stage and contains 28 10 by 10-ft ball mills.

The White Pine mine in northern Michigan began operations during the year with the first ball mill getting under way in October. Output is to be stockpiled until the smelter is blown in.

Details of Cananea's leaching operation have been released. Iron consumption amounts to about 1¼ lb per lb of copper and the leaching solution contains 2½ grams of acid per liter. The spent solution contains .015 grams per liter. The capacity of the mill is expected to be 1,000,000 lb of copper per month.

A contract was awarded and work begun on the Aurora, Minn., plant of the Erie Mining Co. It is estimated that nearly \$300,000,000 will be spent on the job, which is scheduled for completion by July. This will be the largest concentrator ever built and is expected to turn out some 7,500,000 tons of taconite pellets per year.

To Reserve Mining Co. goes the honor of having shipped the first full cargo of taconite pellets. Shipped on May 19, they were produced at Reserve's Babbitt, Minn., plant. Flow sheet involves four stages of crushing, rod mill and ball mill grinding and magnetic separation. Eight sections of the new plant are expected to be in operation late this year. A

new method of pelletizing is to be used at the E. W. Davis works of the company. The process involves the addition of water, bentonite and powdered coal to the dry concentrates followed by balling in a revolving drum and hardening in a travelling grate furnace.

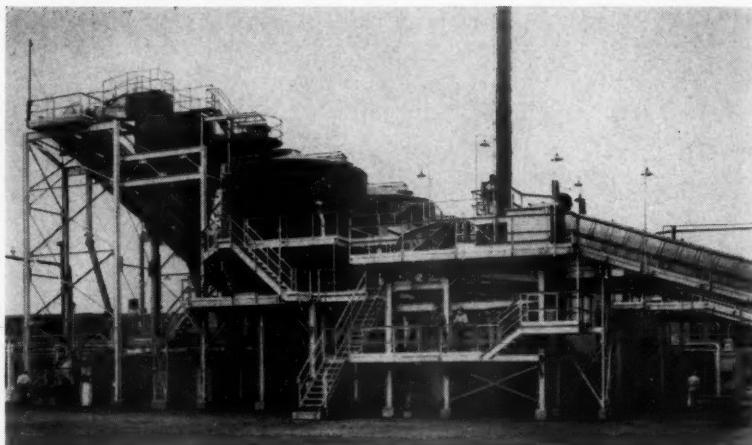
The Humboldt Mill of the Cleveland Cliffs Iron Co. was put into operation on March 1. Primary crusher is fed by 22-ton ore trucks, which drive directly over the unit, dumping into a hopper which feeds into the crusher. All conveyors in the mill are equipped with step-type starting controls to prevent excess tension in the belts. The mill was designed to provide one-floor operation with a minimum of equipment above and below. All electric controls are located on a separate floor with emergency push-buttons at strategic points throughout the plant.

This mill marks the first commercial use of flotation on iron ore in the United States. The flow sheet involves three stages of crushing, rod mills, ball mills and flotation. Cyclones are used to get rid of five-micron slimes, although the actual split is made at 20 microns. The plant turns out a 62-percent concentrate from heads that run 34 percent.

Among other interesting developments in the iron ore field was the first installation of a heavy medium plant for iron ore in the Rocky Mountains, near Guernsey, Wyo. This plant processes 75 tph of feed to produce 50 tph of concentrates. Another is the West Hill plant of Pickands Mather where 40- to 45-percent ore is concentrated in a circuit which includes heavy medium separation, washing, cyclone treatment and magnetic separation.

Increase Nickel Production

Also in the news were the following: Sherritt Gordon's Lynn Lake concentrator which was able to handle 2300 tpd or 15 percent more than its rated capacity; International Nickel Co. increased the capacity of its Creighton concentrator to 12,000 tpd of ore; Nicaro Nickel Co., Freeport Sulphur subsidiary, continued to develop its new nickel ore deposit at Moa Bay, Cuba and reportedly will spend \$55,000,000 for mining and processing facilities. It was also reported that National Lead Co. will expand nickel production by 75 percent at Nicaro. Overseas, Falconbridge Nickel Co. is expanding production in Norway to produce 45,000,000 lb per year. Increased production at Sudbury is also scheduled and a new process for treating pyrrhotite has been reported. Sherritt Gordon's refining plant near Edmonton, Alberta, also started operations in mid-year and this company reported that its leaching plant at Fort Saskatchewan



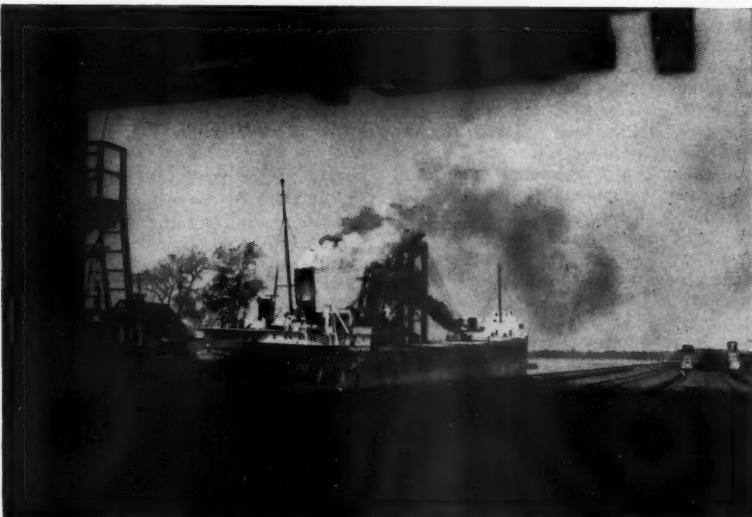
FluoSolids system for roasting pyrite to produce SO₂ gas and calcine for iron manufacture

was in operation and that full production was expected by the end of the year.

Commercial sulphur production from low grade ores was begun in Mexico. U. S. Tin Corp. is installing a 100-ton flotation plant at Lost River, Alaska. During the year Tungsten Mining Corp. of Henderson, N. C., increased production from 300 to 650 tpd. Rod mills replaced rolls for fine crushing and are also used for coarse grinding. Hubnerite is recovered by jigs and tables. Tilting tables are used for slime recovery. Of particular note are the infra-red dryers used on concentrates here for the first time. Operating costs are quoted at \$2.00 per ton. Maintenance is low and there is very little dust produced. One dryer with a capacity of 600 lb per hr consumed 26.5 kw. Also among the tungsten producers, Minerals Engineering Co. completed a 300-ton tungsten mill at Glen, Mont. and started operations.

As the mining industries most ac-

tive branch, uranium figured prominently in the news during the year. International Minerals & Chemical Co. in Florida began recovery of by-product uranium. It is reported that one lb of oxide is obtained from 60 tons of overburden and phosphate rock. The first plant designed specifically to treat uranium ores in the U. S. is being built at Shiprock, N. M. Texas City Chemical Co. is also recovering uranium as a by-product from its new phosphate plant in Texas City. Additional facilities are being installed at the AEC's Monticello, Utah plant to treat refractory uranium ores. Throughout the Colorado Plateau area new mills are being constructed to treat uranium ores. South Africa's 23rd gold mine was scheduled to produce uranium as a by-product. The first uranium plant in Australia, at Rum Jungle, went into operation on September 17 and in northern Rhodesia pilot plant studies are under way to develop a flotation



First full cargo of taconite pellets was shipped by Reserve Mining Co.



Uranium was recovered as by-product at several phosphate plants

process for uranium ores. Climax Molybdenum Co.'s full mill went into operation with capacity increased to 27,000 tpd. Total production from Climax during 1954 amounted to 42,500,000 lb.

Crushing, Grinding, Classification

Notable development in this field was a newly designed machine of German origin. It uses all known principles of grinding and pulverizing, including compression, impact, attrition, cutting and shredding and, in addition a ricochet action. Miniature wind storms of 860 fpm are created and controlled within this novel mill. For fine grinding two new pulverizers were brought out during the year, one employing air jet and the other centrifugal action. In the crushing field F. C. Bond compared the efficiency of blasting with crushing and found that their mechanical deficiencies are approximately equal. Homestake replaced its stamps, rod mills, ball mills, and pebble mills with new rod mills and ball mills. Inspiration remodelled its crushing plant installing two seven-ft cones to replace four gyratories and eight four-ft horizontal disc crushers.

Henry W. Hitzrot published a useful correlation of the applications and limitations of various types of classifying equipment. In the sizing and classifying field cyclones again came in for a lot of discussion. Lewis and Johnson described the use of the liquid-solid cyclone at Copper Hill, Tenn. A direct comparison of the cyclone with the original classifier in use at this property was not possible, because the classifier was actually undersized for the work it was called upon to perform. The cyclone installation cost 83 percent more to operate than did the classifier. However, it was believed that the difference in initial investment would favor the cyclone. A break down of operating cost shows for the cyclone a

total of \$3.52 per day as compared with the classifier cost of \$1.21 for maintenance and \$.71 for power.

At one property in South Africa one \$840 cyclone replaced three bowl classifiers which cost \$33,600. In the primary circuit one 27-in. cyclone had the same capacity and performance as a 10-ft by 26-ft duplex rake classifier. The use of cyclones for classifying is widespread in South Africa. The reasons given for this popularity are the reduced initial cost and space requirements. It was found that the cyclones had greater operating and maintenance costs than mechanical classifiers. However, conditions at individual operations still determine which will be most economical. During the year the development of a three-product classifier was reported which can make overflow, middling and underdash flow product. The unit is controlled from the outside and its operation can be varied by shutting it down.

A novel use for cyclones was devel-

oped when four six-in. units were mounted on a truck. This was driven out to the tailings storage area where the cyclones were used to produce a sand product for building up the dams. Tailings are pumped from the mill to the cyclones by a four-in. Wilfley pump.

In summing up the case for cyclones it can be said that these units have enormous capacity in contrast to their size. They also have simplicity of operation and low initial cost and are valuable and useful tools, although they have their limitations.

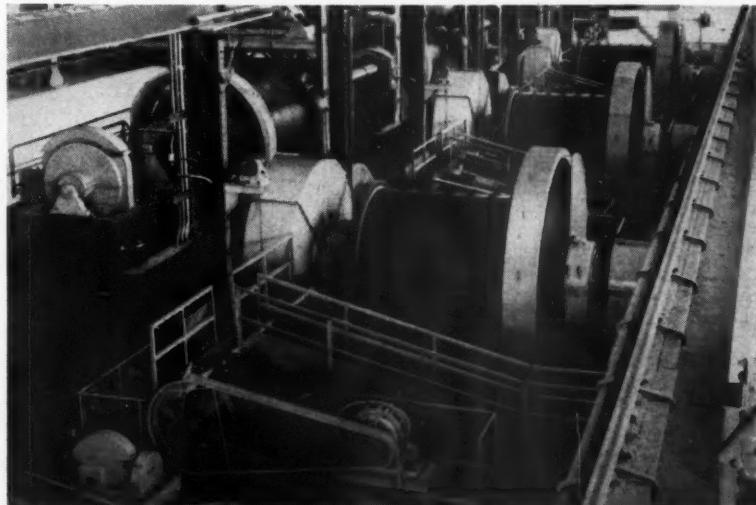
New Equipment Introduced

Among new developments introduced to the industry during the year were the following: a rubber conveyor belt classifier to replace mechanical raking. Pool is formed at the bottom of an incline by flexing a rubber conveyor belt which runs up the incline carrying away the sands as fast as they settle on the bottom of the pool.

A new Bailey density controller and recorder which is operating at Bunker Hill & Sullivan is reported to have led to more uniform operation and more uniform particle size from the grinding circuit.

Foxborough introduced an electromagnetic flow meter for two to eight-in. pipelines to measure the volume-flow rate. McLanahan & Stone developed a new high-speed crusher for breaking down soft ores. Plastic valves can now be obtained in two and three-in. sizes to withstand pressures up to 150 psi and temperatures to 170° F.

Allen-Sherman-Hoff introduced a new centri-seal pump to be used for abrasive and corrosive mixtures and Wemco introduced a new pump for handling pulps. This pump operates on a new principle and any particle



Homestake's new grinding section handled 4000 tpd in rod mills and ball mills

that can pass through the intake and outlet pipes can be successfully handled.

In the flotation field, Mercaptans were shown to absorb on zinc minerals either from solution or from the gas phase. New Broken Hill researchers showed that rock drill lubricants may have a detrimental effect on flotation. Potash Co. of America reported an amine flotation process for potash. Denver Equipment Co. announced a new suspended unit for sub-A cells. Units can be replaced, according to the manufacturer, in less than 10 minutes by the removal of only four bolts.

S. C. Sun of Pennsylvania State University in a paper on coal flotation claimed that the floatability of coals depends on the proportion of floatable and non-floatable components. The floatable components he identified as carbon, hydrogen, and sulphur, and non-floatable components as oxygen, nitrogen and water.

Clarkson reported use of aeroflocculation reagents to provide increased settling and filtration rates of fine solids. Addition of relatively minute amounts of these reagents are reported to have resulted in marked improvements. Dow Chemical Co. introduced Separan 2610, a new flocculating agent which is said to markedly increase the settling rates. General Mills brought out Guartec, a flocculant and flotation depressant, made from the Guar bean. It reportedly produced startling results both in the laboratory and in practice.

Report on FluoSolids

FluoSolids, as usual, also came in for their share of attention during the year. Golden Cycle reported on operating conditions at its Carlton mill. Gold extraction from roasted calcines averaged 97.5 percent, with roasting costs averaging \$3.96 per ton of concentrates. In addition to the numerous applications of this versatile tool, its use is now extended to roasting pyrite to produce sulphur dioxide and calcine for iron manufacture, roasting of arsenopyrite, roasting zinc concentrate and sulphate roasting of copper-zinc concentrates. Its use at Weed Heights, Nev., to produce sulphur dioxide from the roasting of low-grade sulphur ores was also described during the year.

Materials handling, particularly conveying, is always an interesting subject. During the past year, the emphasis seemed to be on length of haul. It was announced that Pittsburgh Consolidation Coal Co. has completed plans for a 110-mile long coal pipeline from Cadiz, Ohio to Castle Lake near Cleveland. This pipeline will carry coal crushed to $\frac{1}{8}$ -in. size which when mixed with water will be pumped at high pressure. A saving of



Within their limitations, cyclones were found to provide tremendous capacities for their size

\$1.25 per ton on transportation costs over this length haul is expected.

Longest conveyor belt system in the United States will be Carlsbad in the mines of the Potash Co. of America. The present 5800-ft underground conveyor will be extended to approximately $7\frac{1}{4}$ miles. Another long rubber-conveying belt was installed by the Ohio Power Co. to transport 800 tph of coal over a $4\frac{1}{2}$ -mile course. Construction was complicated by the necessity of crossing roads and a river en route. In Africa a conveyor system was installed at the Williamson diamond mine, Tanganyika, to transport 300 tph of diamond ore over a two-mile distance. Back at home the Pennsylvania Railroad's new \$10,000,000 ore pier near Philadelphia includes a 54-in., 1600-ft conveyor belt made of rubber, reinforced with high strength steel cables. Long conveyor belts carrying heavy loads at high speed necessarily make for high tension in the fabric of the belt itself, and during the year several manufacturers announced new developments specifically

designed to take care of such internal stresses and also featured coverings designed to resist the abrasion and tearing to which ore-carrying belts are subject.

Engineer Supply

Scarcity of young engineers capable of advancing through the years to more responsible positions still plagued the mineral industry. The demand for technical graduates was about the same in 1954 as in the previous year and the salaries were either the same or higher. Many companies were unable to hire as many engineers as they required even at starting salaries ranging from \$326 to \$375 per month. To help alleviate the shortage in the future, many mining companies announced new scholarship and fellowship programs during the year. It is hoped that these programs will attract sufficient numbers of qualified students to take their places as the operators, researchers and mining executives of the future.



Full mill went into operation at Climax with output of 27,000 tpd

Tungsten Mining in 1954

New All-Time Production High Set But Consumption Was Down

By W. LUNSFORD LONG

Vice-President and General Counsel
Tungsten Mining Corp.
and
President of The Tungsten Institute
Washington, D. C.

A BACKWARD look at tungsten mining in the United States during 1954 reveals nothing to cheer the hearts of those engaged in the business. Final figures place domestic production of tungsten for 1954 at about 860,000 units of WO_3 or some 13,640,460 lb of contained metal, establishing a new all-time high for the industry in this country.

While production was increasing, consumption of tungsten concentrates in the United States for 1954 on the contrary was decreasing markedly and for the year will approximate only some 4,100,000 lb of contained tungsten, which is less than one-third of domestic production.

The supply and demand comparison at the end of 1954 is a remarkable tribute to the success of the Government's domestic tungsten buying program as a stimulus to production. But the decline in consumption is most disconcerting to the tungsten miner as he looks at the future. This is a striking contrast to the situation that existed in 1951 when the Government's tungsten purchase program was adopted and from that of 1952 when the Defense Production Administration stated that the desired tungsten production goal was an annual 40,000,000 lb of WO_3 .

Government Purchases

From January 1, 1954, to mid-March the world price of tungsten concentrates continued to go down, reaching a low in March of \$23 to \$28 a unit c.i.f. duty paid in the United States. Thereafter, the world price increased gradually and at the year end stood at \$34 to \$37 a unit c.i.f. duty paid in the United States. Thus it can be seen by all of those familiar with tungsten mining in the United States that at all times during 1954 foreign tungsten could be bought duty paid in the United States at a price below the cost of domestic production. As a consequence, the entire domestic production last year went to the Government under the guaranteed price purchase program. During 1954 the Government purchased 860,158 units of domestically

mined tungsten, and prior to 1954, 599,893 units were acquired under the program, making a total of 1,460,051 units purchased and leaving an undelivered balance of 1,539,949 units in the program's goal of 3,000,000 units.

If the Government's buying program were to end when the 3,000,000 units of domestic origin had been bought then the Government's guaranteed price program would come to an end apparently on or about October 15, 1956, unless the program were extended either by Administrative or Congressional action or by re-interpretation of Public Law 206 signed by President Eisenhower on August 7, 1953. A careful study of the language of this Act would seem to indicate that it was the evident intention of the Congress that the buying program for tungsten of domestic origin be extended to July 1, 1958, rather than to terminate on July 1, 1956, or when 3,000,000 units of domestic origin had been bought.

During 1954 some new facilities for treating tungsten ores were brought into production and some others started which had not been completed at the year's end. Production for 1954 at the larger tungsten operations in the country showed increases in most instances. There were production increases also at some of the smaller operations and some new production came in from smaller producers. No new ore bodies of any particular magnitude were reported to have been found or developed during 1954.

Tariff Hearings

The tungsten mining industry was put on notice in late fall that a reduction in the duty on tungsten ore or concentrates had been proposed in connection with a trade agreement to be negotiated with Japan at Geneva early in 1955. At the hearings held in Washington in this connection in December 1954 briefs opposing any reduction in the duty on tungsten were filed on behalf of the industry by Charles H. Segerstrom, Jr., president, the Nevada-Massachusetts Co.;

James P. Bradley of Bradley Mining Co., and W. Lunsford Long of the Tungsten Mining Corp., who is also president of the Tungsten Institute of Washington, D. C., with the Committee for Reciprocity Information and the United States Tariff Commission as well. Mr. Long made a personal appearance also before both the Committee for Reciprocity Information and the United States Tariff Commission opposing any reduction in the tungsten tariff, and Hon. Clair Engle, Member of the House of Representatives from the Second District of California, also made a voluntary appearance before the Committee for Reciprocity Information in opposition to any reduction in the duty on tungsten concentrates.

It is felt that the consumption figures are perhaps somewhat distorted due to inventory consumption and a reduction in the normal amount of retooling done during the year, and a considerable increase over the 1954 figure may reasonably be expected for 1955.

A factor which has no doubt contributed to the decline in consumption is the Government's insistence on eliminating critical alloy content in the designs of power plants for piloted aircraft and missiles. Tungsten is listed as one of these critical alloying elements.

The Tungsten Institute, which speaks for a majority of the domestic producers, is seeking to inform the Government and the American public that tungsten is now being produced in sufficient quantities in the United States to relieve restrictions upon its use, and to inspire metallurgical designers with the knowledge that tungsten is now available in quantity and will continue to be available in even greater quantities in the future, if more is needed either for military or civilian purposes. And since tungsten is the most heat resistant of all the metals, it can be assumed, with reasonable safety, that in the Atomic and High Temperature Era upon which we are entering, new applications will constantly be found for the metal and over the years its consumption must increase.

Howdy Podner



Las Vegas, Oct. 9-12 (p. 159)



This 255,000-lb cross-head is part of a German hydraulic press which will permit extrusion of larger shapes and sizes in magnesium than ever before

Magnesium In 1954

Although Primary Production Was Down, Technologic Advances and Wider Markets Promise Bright '55

By JERRY SINGLETON
Executive Secretary
The Magnesium Association

TECHNOLOGICAL progress rather than increased sales marked the magnesium industry in 1954. Sales volume of both wrought and cast magnesium products was off. However, the industry ended the year in better position than it had hoped to.

Statistically, primary production was down about 25 percent; casting shipments were off approximately 28 percent; and wrought product shipments declined probably no more than 23 percent. Manufacturing costs continued high and tended to move upward on reduced operating rates. The result of this was unsatisfactory profit from magnesium operations.

An interesting sidelight on this condition is seen in the fact that generally those plants which were totally or predominantly producers of magnesium castings or fabricated parts had

more satisfactory results than did those operations which approached magnesium as just one of the several metals they worked.

The next to last day of the year

brought an announcement from General Services Administration of a three year renewal of the lease of the Velasco, Texas, facilities to Dow Chemical Co. This did much to inspire hope for a bright new year among those selling magnesium in any of its forms. Throughout the fourth quarter, the industry was faced with the threat inherent in the government's avowed intention to permit this primary magnesium producing plant to be placed on a standby basis. Dow Chemical Co. has been its operator since the plant was constructed in the early years of World War II. GSA wanted to sell the facility, Dow wanted to buy it rather than continue under a short term lease which made capital improvements, even though indicated by efficiency, illogical.

With apparent disregard for logic and fact, as well as for national de-

U. S. MAGNESIUM SHIPMENTS—1954 (SHORT TONS)

1954	Sand	Perm. Mold	Castings	Die	Totals	Wrought Products	Primary Ingot Production
January	819	146	260		1,225	486	6,446
February	741	134	224		1,099	529	5,856
March	740	200	254		1,203	645	6,545
April	688	171	175		1,034	446	6,203
May	580	143	145		869	564	6,460
June	619	222	176		1,017	656	6,190
July	483	308	171		962	516	6,049
August	614	264	200		1,078	555	5,771
September	684	182	163		1,029	591	5,325
October	651	190	185		1,026	501	5,148
November						521	4,942
December							

fense, the Justice Department ruled that sale of Velasco to Dow, its operators for more than 11 years, would "tend to increase" a monopoly and would be contrary to the public interest. Thus the sale was blocked.

Dow maintained it had no wish to renew its uneconomic lease and GSA scrambled to find a buyer or, at least, an operator, without success.

Announcement that Dow has accepted an extension of its present lease assures the magnesium industry, the armed forces and civilian users that production facilities which can exceed current demand will be in operation until 1958. Such would not have been the case with Velasco down and a chaotic market condition surely would have resulted.

New Developments

With supplies assured, the developments within the industry take on greater importance, for without exception they indicate new or accelerated markets, and improved competitive positions. New developments fall in several categories. Possibly of major over-all importance are the developments of magnesium thorium alloys. These have already proved their value in castings for jet engines at temperatures up to 700° F and are arousing wide interest in aircraft, rocket and missile fields with present indications that entirely new areas of application for sheets of these alloys are now opened.

World production of magnesium metal, by countries, 1944-48 (average) and 1949-53, in metric tons¹
(Compiled by Helen L. Hunt)

Country	1944-48 (average)	1949	1950	1951	1952	1953
Canada	1,684	... ²	1,600	4,000	5,000 ³	6,000 ³
China, Manchuria	130	... ²	... ²	... ²	... ²	... ²
France	655	494	407	875	1,090	998
Germany:						
East Germany ³	6,000	1,000	1,000	1,000	1,000	1,000
West Germany	1,120 ³					
Italy	546		122	677	976	1,447
Japan	802					
Korea	528					
Norway	400 ³			120	1,300 ³	4,500 ³
Switzerland	340 ³		250	250	300	250 ³
Taiwan (Formosa)	91					
U. S. S. R. ³	15,800	19,000	20,000	30,000	40,000	50,000
United Kingdom ⁴	5,259	2,600	3,000	5,000	4,600	5,400
United States	39,472	10,521	14,266	37,086	95,999	84,436
Total (estimate)	73,100	34,000	41,000	81,000	153,000	154,000

¹ This table incorporates a number of revisions of data published in previous magnesium chapters.

² Data not available; estimate by author of chapter included in total.

³ Estimate.

⁴ Primary metal and remelt alloys.

Industrial developments of importance are the announced process for "hot chamber" die casting of magnesium; and commercial-scale chromium plating. Also new progress with the Dow fast-etch photo engraving process and a new method for curving magnesium printing plates after etching, for use on rotary presses, have combined to speed printing industry acceptance of the lightest of commercial metals.

Finally, the opening of the Dow Mill at Madison, Ill., brings to the

market wrought products in a volume which makes added uses a must for all associated with the metal.

These new uses have been developing. Greatest general good most likely will result from the increasing use in the graphic arts—though this is not necessarily a high tonnage use. Tonnage-wise the greatest promise is found in the growing use as tooling plate by the manufacturing trades. Here increased production facilities have assured supplies which enable industry to take advantage of light weight, ease of machining, flatness and freedom of porosity, as well as other attributes which, though highly desirable, have been difficult to obtain.

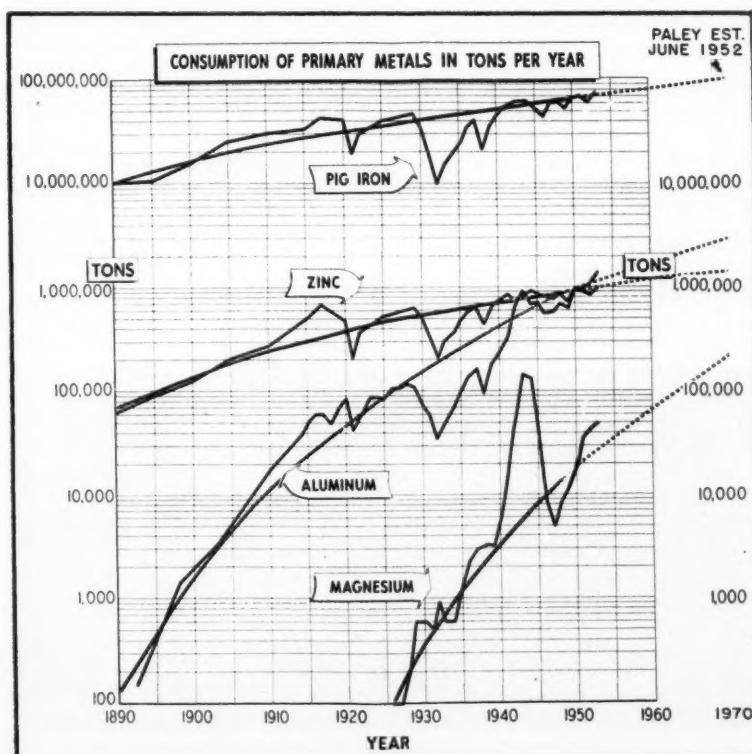
Development of hot chamber die casting equipment by Dow and the installation of the world's largest die casting machine which is suited to magnesium by Doebler-Jarvis, in Toledo, opened new market potentials in automotive, business machines and portable tools and equipment. These, too, can develop as large tonnage users of magnesium.

Ever-increasing use of magnesium as a cathodic protecting agent is a field which promises high tonnage and profitable operations. Magnesium as a protecting agent for pipelines and all metal equipment used underground or in and about sea water is bringing to industry an inexpensive means of adding years of service life to equipment heretofore demanding extensive maintenance over relatively brief periods of time.

Solved Finishing Problem

The finishing of magnesium has long been a problem. Now with the perfection of the ceramic-type coatings such as the HAE process and the Dow #17 process, a practical method of protecting magnesium from most any type of corrosion is avail-

(Continued on page 139)





Total amount of coal mined underground by mechanical methods continued to increase

Sales of Coal Mine Equipment

Continuous Mining Machine and Face Conveyor Sales Up as Others Slip Somewhat

By W. H. YOUNG and R. L. ANDERSON

Respectively, Chief Bituminous Coal
and Lignite Section, and Commodity
Specialist
U. S. Bureau of Mines

SHIPMENTS of mechanical loading equipment for underground use in coal mines in the United States, in terms of capacity, were 10 percent less in 1954 than in 1953. Capacity of mechanical cleaning equipment sold for use at bituminous coal mines was 11 percent less in 1954 than in 1953. Shipments of shuttle cars, "mother" conveyors and room or transfer conveyors for use in coal mines in the United States decreased in 1954 from 1953, while face conveyor shipments increased during the same period.

This survey was made possible by the courteous cooperation of all known manufacturers of mechanical cleaning equipment for bituminous coal mines and manufacturers of mechanical loading and supplementary haulage equipment for use in all coal mines in the United States. Data from various trade journals were also utilized.

Mechanical loading units and supplementary haulage equipment "Sales in 1954" represent shipments made during the year. Of the total capacity of mechanical cleaning equipment sold

in 1954, 61 percent was placed in operation during that year; the remainder (39 percent) will be installed later.

Mechanical Loading and Mining

Bituminous coal and lignite mechanically loaded in underground mines increased from 268,993,989 tons in 1952

to 278,328,982 in 1953 (three percent). Mechanical loading in Pennsylvania anthracite mines decreased from 10,034,464 tons in 1952 to 6,838,769 in 1953 (32 percent).

Table I shows data on bituminous coal and lignite production, by methods of mining, and mechanical cleaning for 1952-54, inclusive. The percentage of total output mechanically loaded and mechanically cleaned continues to increase. During 1954, approximately 87 percent of the total output was mechanically loaded at underground mines, loaded by power shovels at strip mines, or mined by augers along highwalls in strip mines.

Underground production of bituminous coal and lignite, by methods of loading, is shown in table II. The preliminary figures for 1954 show that 82 percent of the underground output



Mobile loading machines in use reached peak in 1954

was loaded mechanically, and the remainder (18 percent) was hand loaded into mine cars.

Auger Mining. The use of augers for coal recovery along highwalls in strip mines began about 1945, but separate data on number of augers in use and tons produced by auger mining was first collected for 1952. Auger mining at soft-coal mines in the United States averaged 25 tons per man per day in 1953, compared with 18 at strip mines and seven at underground mines. Tables 23 and 24 in Bureau of Mines Mineral Market Summary No. 2339 shows a comparison of auger mining with other types of mining. A few coal-recovery augers were used in underground bituminous coal mines, and the production from these mines was included with underground mechanically loaded coal. No shipments of coal augers have been made for use at Pennsylvania anthracite mines.

Reports received from four manufacturers of coal recovery augers show that 55 augers were shipped in 1954 and all except one was for use along highwalls at bituminous coal strip mines. Table III shows auger shipments in 1953 and 1954, and table V the number of augers in use in 1953 and shipments in 1954 by States.

Types of units sold. Table III lists the units of mechanical loading and mining equipment shipped for use at all coal mines in the United States, 1949-54, inclusive. Shipments of mobile loading machines decreased from 181 in 1953 to 109 in 1954, but continuous mining machine shipments increased from 67 to 102 during the same period. Shipments of coal recovery augers, scrapers, shuttle cars, "mother" conveyors, and room or transfer conveyors all decreased in 1954 from 1953. Shipments of face conveyors increased from 51 in 1953 to 126 in 1954, a 147 percent increase.

Exports of underground mechanical loading equipment in 1954, in terms of capacity, amounted to six percent of the shipments to mines in the United States compared with 15 percent in 1953.

Types of mechanical loading equipment sold compared with units in use. Table IV shows the trend in demand for various types of mechanical loading equipment. Mobile loading machines in use reached the maximum in 1951 at bituminous coal and lignite mines and in 1952 at Pennsylvania anthracite mines. However, the 1954 shipments of mobile loading machines were only two percent of the number in use in 1953 at bituminous coal and lignite mines compared with 44 percent at Pennsylvania anthracite mines. The 1954 shipments of continuous mining machines to bituminous coal and lignite mines were 46 percent of the number in use in 1953.

Table V shows the number of me-

TABLE I—BITUMINOUS-COAL AND LIGNITE PRODUCTION, BY METHODS OF MINING AND MECHANICAL CLEANING, IN THE UNITED STATES, 1952-54, INCLUSIVE

	1952 Thousands of net tons	% of total	1953 Thousands of net tons	% of total	1954 ¹ Thousands of net tons	% of total
Hand-loaded underground	87,431	18.7	71,222	15.6	52,000	13.3
Mechanically loaded under- ground	268,994	57.7	278,329	60.8	244,000	62.2
Mined at auger mines	1,506	0.3	2,291	0.5	3,000	0.8
Mined by stripping	108,910	23.3	105,448	23.1	93,000	23.7
Total production	466,841	100.0	457,290	100.0	392,000	100.0
Mechanically cleaned	227,265	48.7	241,759	52.9	224,000	57.1

¹ Preliminary.

TABLE II—UNDERGROUND BITUMINOUS-COAL AND LIGNITE PRODUCTION, BY METHODS OF LOADING, 1952-54, INCLUSIVE

	1952 Thousands of net tons	% of total	1953 Thousands of net tons	% of total	1954 ¹ Thousands of net tons	% of total
Mobile loading machines:						
Loading direct into mine cars	75,605,379	21.2	65,910,130	18.9	(²)	(²)
Loading into con- veyors	11,078,827	3.1	10,532,695	3.0	(²)	(²)
Loading into shut- tle cars	132,297,476	37.1	156,142,324	44.6	(²)	(²)
Continuous mining machines	8,214,757	2.3	11,830,097	3.4	(²)	(²)
Scrapers	76,969	(²)	238,839	.1	(²)	(²)
Conveyors equipped with duckbills or other self-loading heads	10,590,076	3.0	8,530,949	2.4	(²)	(²)
Hand-loaded con- veyors	31,130,505	8.8	25,143,948	7.2	(²)	(²)
Total mechani- cally loaded:	268,993,989	75.5	278,328,982	79.6	244,000,000	82.4
Hand-loaded into mine cars	87,431,370	24.5	71,221,990	20.4	52,000,000	17.6
Total under- ground pro- duction	356,425,359	100.0	349,550,972	100.0	296,000,000	100.0

¹ Preliminary.

² Included with "Total mechanically loaded."

³ Less than 0.05 percent.

TABLE III—UNITS OF MECHANICAL LOADING AND MINING EQUIPMENT SOLD FOR USE IN COAL MINES, AS REPORTED BY MANUFACTURERS, 1949-54, INCLUSIVE

Type of equipment	1949	1950	1951	1952	1953	1954	Change from 1953 (percent)
Bituminous-coal and lignite mines:							
Mobile loading machines	286	269	287	206	{ 180 67	92 101	-49 +51
Continuous mining machines					57	55	-4
Augers	(¹)	(¹)	(¹)	(¹)	11	5	-55
Scrapers ²	8	1	4	8	11	5	-55
Shuttle cars	543	465	524	428	437	242	-45
Conveyors ³ :							
"Mother"	116	132	114	67	58	19	-67
Room or transfer	394	316	297	155	87	61	-30
Face ⁴	160	116	111	76	49	115	+135
Anthracite mines (Pennsyl- vania):							
Mobile loading machines . . . . .	...	...	...	...	1	17	+1,600
Continuous mining ma- chines						1	.....
Scrapers ²	10	8	8	5	3	14	.....
Shuttle cars							
Conveyors ³ :							
"Mother"		1					
Room or transfer	147	57	34	34	16	24	+50
Face ⁴	5		8	13	2	11	+450
Number of manufacturers re- porting	22	20	21	22	25	23	.....

¹ Not available. Total number of augers sold 1946-52, inclusive, was 271.

² Reported as scrapers or scraper haulers and hoists.

³ Conveyors are classified as to the length the power unit has capacity to take: "Mother," capacity over 500 ft; room or transfer, capacity 100 ft to 500 ft; face, capacity under 100 ft.

⁴ Includes "bridge" conveyors, beginning in 1950.

TABLE IV—SALES OF MECHANICAL LOADING EQUIPMENT IN 1954 COMPARED WITH MACHINES IN USE IN PRECEDING YEARS

	Number of machines in use, as reported by mine operators							Number of machines sold as reported by manufacturers in 1954
	1947	1948	1949	1950	1951	1952	1953	
Bituminous-coal and lignite mines:								
Mobile loading machines	3,569							
Continuous mining machines		3,980	4,205	4,318	4,410	4,083	3,985	92
Scrapers	67	56	46	39	22	19	219	101
Pit-car loaders	71	37	17	12	(1)	(1)	29	5
Conveyors equipped with duckbills or other self-loading heads	1,531	1,632	1,483	1,329	1,242	1,049	849	(3)
Hand-loaded room conveyors, number of units	3,979		4,125	4,312	4,434	3,904	3,569	61
Anthracite mines (Pennsylvania):								
Mobile loading machines	25		19	27	30	43	54	17
Scrapers								1
Continuous mining machines	594		643	589	556	528	456	489
Hand-loaded room conveyors, number of units ¹	3,457		3,562	3,618	3,460	3,282	3,232	2,784
								24

¹ Canvass of pit-car loaders was continued in 1951.

² Canvass of sales of pit-car loaders discontinued in 1945.

³ Sales of conveyors equipped with duckbills or other self-loading heads are included with hand-loaded room conveyors.

⁴ Includes pit-car loaders and conveyors equipped with duckbills or other self-loading heads.

chanical loading units shipped to various States in 1954 compared with the number in use in 1953, as reported by mine operators. Sales of room con-

veyors as listed in table V are not exactly comparable with the number of room conveyors in use. To avoid duplication in tonnage mechanically loaded,

the mine operator was instructed to report "hand loaded" and "self loading" conveyor tonnage only; therefore, room conveyors loaded by mobile loaders are not included with "room conveyors in use in 1953."

TABLE V—MECHANICAL LOADING AND MINING EQUIPMENT IN USE IN 1953, BY STATES, COMPARED WITH SALES REPORTED IN 1954

State	Mobile loading machines		Continuous mining machines		Scrapers		Room conveyors		Augers	
	In use in 1953	Sales in 1954	In use in 1953	Sales in 1954	In use in 1953	Sales in 1954	In use in 1953	Sales in 1954	In use in 1953	Sales in 1954
Bituminous-coal and lignite mines:										
Alabama	123	12	8	2	...	137	1	...	1	
Alaska	3	2	...	2	10	3	3	...	...
Arkansas						64				
Colorado	36	1	5	...	1	211				
Illinois	309	1	20	6		13				
Indiana	107	1	...	...				
Iowa	2					1				
Kentucky	471	17	13	...		526	15	4	10	
Maryland						12	1	3		
Montana	31					6				
New Mexico	16				4	2				
N. Dakota	4									
Ohio	164		17	1		58	1	10	12	
Oklahoma	5					127				
Pennsylvania	927	5	112	38	9	2	666		7	9
Tennessee	28		5	2	3		54		3	
Utah	123		2	3		45				
Virginia	144	11	2	2		119	10	3	1	
Washington			6		6		95			
W. Virginia	1,456	37	32	47		1,496	30	64	22	
Wyoming	36		2		2	208				
Total bituminous coal and lignite mines	3,985	92	219	101	29	5	3,843	61	94	55
Anthracite mines (Pennsylvania)	39	17	...	1	489	...	2,784 ²	24	...	...
Grand total	4,024	109	219	102	518	5	6,627	85	94	55

¹ Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.

² Includes also pit car loaders.



Shuttle car exports were up

Mines Mineral Market Summary 2339. Exports of shuttle cars increased nine percent in 1954 from 1953.

Face conveyors. A face conveyor is 10 to 100 ft in length and is used parallel to the face of the room to move material along the face to a room



Two-thirds of coal-cleaning equipment sales were for additions to present installations

conveyor. Table III lists total sales, 1949-54, inclusive, and table VI lists sales, by States, for 1953 and 1954. Data on the number in use are not available.

"Mother" conveyors. For the purpose of this study a "mother" conveyor

TABLE VI—UNITS OF CONVEYING EQUIPMENT SOLD FOR USE IN COAL MINES, 1953-54, BY STATES

	Face conveyors ¹		Shuttle cars		"Mother" Conveyors ²	
	1953	1954	1953	1954	1953	1954
Bituminous-coal and lignite mines:						
Alabama	...	...	27	26	3	...
Colorado	...	2	...	1	1	1
Illinois	...	17	1	12	6	6
Indiana	...	6	2	...	2	2
Kentucky	8	23	49	36	5	...
Maryland	...	1	...	...	...	...
Ohio	...	7	...	...	1	1
Oklahoma	...	...	...	3	...	...
Pennsylvania	1	...	140	42	14	3
Tennessee	...	2	...	...	...	...
Utah	...	10	8	1	1	1
Virginia	1	14	45	15	1	...
West Virginia	39	77	118	112	18	5
Wyoming	...	14	...	...	...	...
Total bituminous coal and lignite	49	115	437	242	58	19
Anthracite mines (Pennsylvania)	2	11	...	14	...	...
Grand total	51	126	437	256	58	19

¹ Includes "bridge" conveyors and all other conveyors 10 to 100 feet long.

² Includes all haulage conveyors with capacity over 500 feet, except main slope conveyors.

is defined as a sectional, extensible, power-driven conveying unit that can handle over 500 ft of conveyor. Main-slope conveyors are excluded. Table III lists sales for 1949-54, inclusive, and table VI shows shipments by States in 1953 and 1954. In 1953, 322 bituminous coal mines used 304 miles of "mother" conveyors. Detailed data by States on "mother" conveyors in use for 1945-53, inclusive, are given in table XXI of Bureau of Mines Mineral Market Summary 2339. Exports of "mother" conveyors increased 133 percent in 1954 from 1953.

Mechanical Cleaning

Reports from 18 manufacturers of bituminous coal-cleaning equipment show that the total capacity of 1954 sales was 6230 net tons of clean coal per hour, compared with 7000 tons of capacity sold in 1953, a decrease of 11 percent. Sales in 1954, by type of equipment, in terms of capacity, show that dense media ranked first, followed by jigs, and wet tables. The capacity of all types of equipment sold in 1954 for cleaning bituminous coal by wet methods was equivalent to three percent of the bituminous coal cleaned by wet methods in 1953, and the capacity of pneumatic equipment sold in 1954 was also three percent of the tonnage pneumatically cleaned in 1953. Approximately 67 percent of the total capacity of cleaning equipment sold in 1953 was for additions to present installations and the remainder, 33 percent, comprised new plants.

Table VII gives data on bituminous coal cleaned in 1953, by States, and the annual capacity of equipment sold in 1954.

TABLE VII—BITUMINOUS COAL MECHANICALLY CLEANED IN 1953 COMPARED WITH SALES OF MECHANICAL CLEANING EQUIPMENT IN 1954, BY STATES

State	Number of plants in operation	1953		Annual capacity of equipment sold (net tons) ¹
		Net tons of cleaned coal	Output mechanically cleaned (percent)	
Alabama	40	11,110,349	88.7	...
Alaska	1	253,570	29.4	(2)
Colorado	5	1,618,150	45.3	...
Illinois	69	35,456,970	77.1	728,000
Indiana	24	12,650,620	80.0	(2)
Kansas	4	1,238,187	72.2	...
Kentucky	77	28,144,723	43.3	937,000
Missouri	10	2,156,543	90.1	...
Montana	2	45,035	2.4	...
New Mexico	1	95,410	18.6	...
Ohio	25	13,576,190	39.1	(2)
Oklahoma	4	623,469	28.8	...
Pennsylvania	89	48,776,471 ²	52.3	1,738,000
Tennessee	9	535,462	9.8	...
Utah	6	2,540,571	38.8	(2)
Virginia	30	7,372,207	38.6	541,000
Washington	11	671,246	97.3	...
West Virginia	204	74,893,404 ³	55.8	3,930,000
Undistributed	...	...	...	537,000
Total	611	241,758,577	52.9	8,411,000

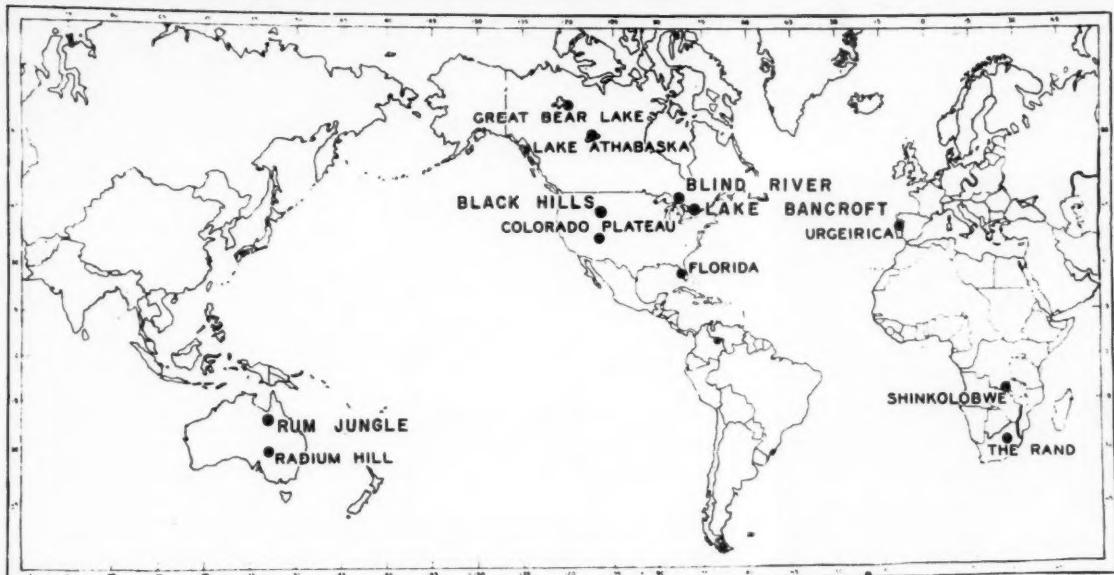
¹ Based on average days mines were active in 1953 and 7.0 hours per day.

² Included in "Undistributed."

³ Includes some coal mined in Pennsylvania and cleaned in Ohio, and a small tonnage mined in other States and cleaned at a consumer-operated plant in Pennsylvania.

⁴ Includes some coal mined in West Virginia and cleaned in Pennsylvania.





Significant uranium deposits of the Free World

Uranium Mining

**Now a \$100,000,000 Industry. Uranium Production Has
Become a Major Segment of U. S. Mining**

By W. J. WAYLETT
Chief, Technical Services Branch,
Division of Raw Materials, AEC,
Washington, D. C.

THE domestic uranium mining industry has become a major segment of the nonferrous metal mining industry. Now a \$100,000,000 a year industry, the number of people engaged in uranium prospecting, mining, and milling is probably over 15,000.

In a few short years uranium has moved from a minor metal to the status of the most sought after mineral commodity of the day, and probably more magazine articles and Sunday supplement features appeared on uranium than on any other subject during the past year.

In the past year or two the entrance into the industry of many long established mining companies has greatly strengthened the industry and intensified its varied activities. Ore production continued to increase in 1954 and exploration activity was expanded, particularly by private industry.

Over 900 mines produced ore during 1954, many of them small operations employing a few men and shipping ore intermittently. More ore was processed than ever before as the milling capacity of the industry grew.

A substantial number of large and small producers are steady, continuing sources of ore. Among domestic producers during 1954 were: Anaconda Copper Mining Co., Climax Uranium Co., Consolidated Uranium Mines, Inc., Garwood and Gerlach Mining Co. (lessors in the MiVida Mine of Utex Exploration Co.), Golden Cycle Corp., Haystack Mountain Development Co., Homestake Mining Co., Navajo Uranium Co., Shattuck-Denn Mining Co., U. S. Vanadium Co., Utex Exploration Co., the Vanadium Corporation of America, and Worcester Mines.

While the Colorado Plateau remains production center of the domestic industry, output was expanded in a number of other areas and several new areas produced uranium ore for the first time.

New Mining Law

The past year also saw a major amendment to the mining and mineral leasing laws. On August 13, 1954, the President signed Public Law 585—83rd Congress, amending the mineral laws to provide for multiple mineral

development on the public land. The law makes it possible to establish valid mining claims on lands previously leased for oil and gas exploration which had been closed to mineral entry. Prior to the uranium boom there had been little awareness of this basic conflict between the mining and mineral leasing laws since most metallic mineral deposits occur in mountainous areas rather than in the flat lying sedimentary beds that contain the nonmetallic minerals leaseable under the Mineral Leasing laws.

When several producers staked claims, shipped ore and applied for the initial production bonus offered by the U. S. Atomic Energy Commission, a search revealed that their claims were not valid because of pre-existing leases for nonmetallic minerals.

To obtain production and to encourage exploration, two steps were taken. A law was passed in 1953 (Public Law 250—83rd Congress) providing validation of claims staked between July 31, 1939 and January 29, 1953. On January 29, 1954 the Atomic Energy Commission issued Domestic Uranium Program Circular 7, providing for issuance of uranium mining leases on deposits found on public lands covered by oil and gas leases.

When the passage of Public Law 585 eliminated its need, the Commission terminated Circular 7, effective December 12, 1954. As a result of Public Law 585 and Public Law 703, the Atomic Energy Act of 1954, the reservation of uranium deposits to the Government on public lands provided in the Atomic Energy Act of 1946 has been revoked.

Exploration Active

Exploratory drilling by the AEC, U. S. Geological Survey and U. S. Bureau of Mines exceeded 1,150,000 ft. Private efforts probably exceed the Government's by two or three times and resulted in many new ore discoveries in previously proved and new areas, including many outside the Colorado Plateau.

Airborne radiometric surveying continues to be one of the most effective tools for prospecting wide areas for uranium. The number of orebodies discovered by this technique increases each month. The AEC utilized nine light aircraft and posted index maps showing newly discovered anomalies on the fifteenth of each month at its exploration offices. Arrangements were made recently for the sale of these maps through the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. on an annual subscription basis.

The U. S. Geological Survey continued operation of two DC-3 aircraft for radiometric surveying work. Estimates of the number of planes flown by private interests or the miles traversed are difficult to make, but it is estimated that 75 private planes were flown and that this activity is several times that of the Government.

The Atomic Energy Commission closed its exploration headquarters in New York in August and transferred functions and staff to its Washington, D. C., headquarters.

Expand Processing Capacity

Kerr-McGee Oil Industries, Inc., placed a new acid leach unit in operation in November at Shiprock, N. M., to treat ores produced in the nearby Lukachukai and Carrizo Mountain areas, principally by the Navajo Uranium Co., a subsidiary of Kerr-McGee. The plant operates on a custom basis, processing and treating ores from producers in the area. Kerr-McGee took over operation of the ore-buying station at Shiprock, operated for the AEC since 1952 by the American Smelting and Refining Co.

Expansion of ore processing facilities was accomplished by Vanadium Corporation of America, Durango, Colo., by U. S. Vanadium Co. at Uravan, Colo., and by the AEC at Monticello, Utah. The latter is the only Government-owned mill and is operated by the Galigher Co. Expansions were started by Anaconda Copper Mining Co., at its Bluewater plant, Grants, N. M.; by Vitro Uranium Co., Salt Lake City; by Climax Uranium Co., Grand Junction, Colo.; and by Vanadium Corporation of America, Naturita, Colo. Another expansion is contemplated by the Commission for the Monticello mill. This will add an acid leach circuit to supplement the alkaline leach circuit used at present.

Anaconda now employs a carbonate leach to treat the limestone ores of the Todilto formation, but its expansion involves building a completely new plant using an acid leach. With both acid and carbonate leaching circuits in operation at Bluewater, Anaconda will be able to treat a wide variety of ores. Principal source of ore for the new plant will be Anaconda's Jackpile mine and other deposits on the Laguna Indian Reservation.

Discuss Other Plants

Discussions are under way for further expansions and for additional ore processing facilities to handle the ever-increasing output of the mines. Ore continues to go into stockpiles, at Commission-owned ore buying stations and sampling plants. The Uranium Reduction Co. is planning construction of a large plant at Moab, Utah to serve the nearby Big Indian district. Another mill to process ores from Big Indian and from the Bull Canyon districts is being given consideration. U. S. Vanadium is considering a further expansion of the Uravan mill.

Another area with an increasing need for ore processing facilities is the Black Hills region of South Dakota and Wyoming. A sizeable stockpile has accumulated at the Commission's buying station at Edgemont, S. D. Proposals for construction of a mill are presently under review by the Commission. A mill may be built

in the White Canyon area of Utah to handle ore from the Happy Jack mine, owned and operated by Bronson and Cooper, as well as ore produced by other operators in the area.

Uranium is being recovered at four plants as a by-product of processing Florida phosphate rock for fertilizer and phosphoric chemicals. Two of the plants, at Bartow and Nichols, Fla., were placed in operation in 1954 by International Minerals and Chemical Corp. and Virginia-Carolina Chemical Corp. As the year ended, a contract was signed for the construction of a fifth unit at East Tampa, Fla., by U. S. Phosphoric Products Division of the Tennessee Corp.

New Ore Buying Stations

The Commission established new ore buying stations in 1954 at White Canyon and Moab, Utah, to provide a market for ores produced by nearby mines until mills can be constructed at these sites. Another station is being completed at Riverton, Wyo., where substantial tonnages of ore have been developed. It is also probable that a buying station will be established near Globe, Ariz., to stimulate prospecting activity in the surrounding area and provide a market for ores now produced in the area.

Operator of the new ore buying stations is the American Smelting and Refining Co. which also operates the Commission's other stations at Marysvale and Monticello, Utah, and Edgemont, S. D.



Public Law 585 makes it possible to stake valid mining claims on land previously leased for oil and gas exploration

Mining Methods Change

In recent years the discovery of relatively large uranium ore bodies in the Shinarump and Chinle formations has brought changes in the pattern of mining operations in the Colorado Plateau. Formerly operations were largely conducted through small adits, or inclined headings into shallow ore bodies, utilizing hand methods of transporting ore or, at best, diesel-powered shuttlecars. Such operations required little mine track or ventilation equipment. Considerable mining of this sort is still carried on, particularly in the small, two or three-man operations.

Today, mining operations on the Plateau have a look of permanence. Several open pit mines are operating and as ore bodies are found at depth, steel headframes and more extensive surface plants have appeared. Mechanized equipment and up-to-date mining methods have become commonplace on the Plateau.

One of these is operated by the Homestake Mining Co. which has developed under lease the Little Beaver

Mining Co. and the La Sal Mining and Development Co. properties in the Big Indian district. Utilizing a 10 percent dip toward the adit of the Little Beaver, Homestake has laid rails and is trammimg ore with a diesel trammer and about ten 30-cu ft capacity cars. The main tunnel is in over 3500 ft. Drifts are being driven north and south from the tunnel. A raise into the orebody at the face will facilitate further drifting and the eventual blocking out of ore between exposures. In the La Sal mine electric battery-powered trammimg equipment will transport ore to the 572-ft main shaft. This mine will be considerably larger than the Little Beaver.

Mechanize Operations

At the Mi Vida Mine, Utex Exploration Co. diesel-driven, rubber-tired, trackless loading and haulage equipment is being used in one of the largest mines on the Plateau. Roof bolting has found wide application in this mine where mining faces vary from 20 to 30 ft in height.

Seven adits in the Happy Jack Mine now need ventilating problems. The operators have expanded production and installed additional equipment and, with the Commission's ore buying station nearby at a lower elevation, are considering installing a conveyor belt system to replace the trucks now used to transport ore.

With the introduction of deeper shaft mining to the Uravan Mineral Belt, a relatively high degree of mine mechanization is occurring in spite of the lense-type carnotite ore bodies of the Brushy Basin and Salt Wash members of the Morrison formation, which generally do not lend themselves to mechanization. Golden Cycle, Worcester Mines, and Shattuck-Denn all have introduced rocker shovels for drift loading, as well as air trammers and slushers, and jackleg drills in drifts and stopes. Shattuck-Denn employs a Mancha Mule for haulage.

Three-wheeled, rubber-tired, diesel-powered front-end loaders, which scoop up broken ore and carry 1½-ton loads, are finding increased application in this area and elsewhere. U. S. Vanadium employs this equipment at the Lumsden No. 1 mine on Beaver Mesa, as does its lessor in the Lumsden No. 2 across the canyon.

Open Pit Operations

Anaconda's open pit Jackpile mine on the Laguna Indian Reservation, N. M., is the largest uranium mining operation in the United States. Five miles north of Laguna, N. M., in the Morrison formation, it was discovered two years ago as a result of an airborne radiometric survey. Anaconda had previously been granted exclusive exploration rights by the Tribal Council.

Ore is moved by trucks from mine to railhead for transport to the plant at Bluewater. Anaconda has constructed a spur line into the mine from the main line of the Santa Fe railroad. Since the mine is on the side of a mesa, ore trucks descend to the railhead rather than climb out of a pit.

Stripping of the ore body is being done by the Isbell Construction Co., but Anaconda does its own mining. Porta-drills and churn drills are used for blasthole drilling. Holes are detonated in rows with millisecond delay timing. For handling ore and waste a 1½-yard diesel shovel, a diesel loader and three Dumptors are used. Surface plant consists of office, a combination compressor-warehouse-garage, and a change house. Compressed air and electric power are furnished from diesel-driven compressor and generator.

Adjacent to the Jackpile, Anaconda is developing the pipelike Woodrow deposit by use of two 36-in. diameter calyx-drill hole shafts 100 ft deep. A simple tripod is used over each hole as a headframe. The two holes were connected by a drift and a raise was



Colorado Plateau mines produce the bulk of United States uranium ore

driven alongside one of them, enlarging it to a two-compartment shaft. This serves as a manway and service opening and the other hole is used for ore hoisting and an escape way. Development is proceeding from the connecting drift.

Several open pits are also operated by Anaconda in Section 9, northeast of Bluewater. In the Todilto limestone, these are the result of initial exploration carried out in this area. In the same area the Haystack Mountain Development Co., a subsidiary of Atchison, Topeka and Santa Fe Railroad Co., is operating its Section 9 open pit mine and others, utilizing modern stripping and loading equipment. Santa Fe was one of the pioneer operators in the Grants area and is a leading uranium ore producer.

Vanadium Corporation of America operates the Monument No. 2 mine by underground and open pit methods, near the Arizona-Utah line in Navajo County, Ariz. Some of the ore is marginal and the company has constructed a concentrator for upgrading the ore prior to shipping to its Durango mill. This is the largest of 40 mines operated by VCA, which is one of the top producers.

Mining Goes Deeper

A few years ago only simple wooden headframes were in evidence on the Colorado Plateau and a steel headframe was rare indeed. Compared to the other large, deep shafts in the metal mining industry, uranium shafts may not be impressive, but, significantly, several shafts were sunk in the past year or so to depths exceeding 500 ft and these are only a prelude to deeper operations as ore bodies at greater depths are found and brought into production.

The two-compartment 646-ft Bowen



A petrified log is a bonanza for the uranium miner

shaft of the Golden Cycle Corp. on its AEC lease on Atkinson Mesa in the Uravan Mineral Belt is reported to be the deepest shaft on the Colorado Plateau. The shaft was sunk during 1953 and began operation in April of 1954. The station is 635 ft below the surface and all development work has been done with short raises and open stopes. The Golden Cycle workings are expected to be held through to the Worcester Mines diggings to the west on the same ore horizon. Worcester Mines has also sunk a 296-ft shaft on its AEC lease adjacent to the Golden Cycle lease. The station is at 282 ft.

Another deep shaft in the Uravan Mineral Belt is the Shattuck-Denn Mining Co. vertical shaft on Club Mesa, west of Uravan. It is a 515-ft deep, two-compartment, cribbed shaft, also on an AEC lease. A drift is

being driven west 1200 ft to another orebody, while deposits nearer the shaft are being mined.

In the Big Indian district, in addition to the Homestake Mining Co., 572-ft, three-compartment, La Sal shaft, previously mentioned, the Cal Uranium Co. sank the San Juan shaft 280 ft and is now making regular ore shipments. North American Uranium Co. completed a shaft at 340 ft. Standard Uranium Co. is driving a 2100-ft adit to tap an orebody in the Chinle.

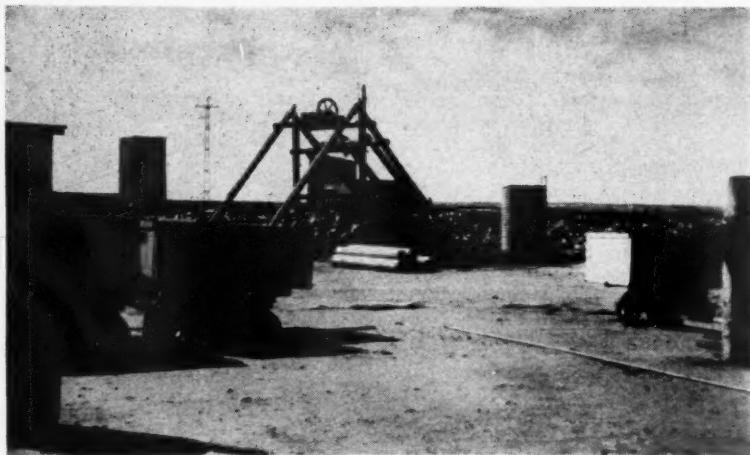
Off Plateau Ore Production

The deepest uranium mine shaft in the United States is off the Colorado Plateau. This is the three-compartment, vertical, Prospector shaft of the Vanadium Corporation of America at Marysvale, Utah. Now over 800 ft deep, both the Prospector and Freedom veins have been extensively developed from the Prospector shaft and steady production has been obtained, particularly from the 300-ft and 700-ft levels. Ground owned by the Bullion-Monarch Mining Co., adjoining the Freedom, is also being developed at depth under lease by VCA. The Marysvale deposits are of primary origin and pitchblende is found in a series of narrow, steep dipping, shear zones, fractures, and veins cutting quartz monzonite. Marysvale represents the largest domestic source of steady production of uranium ore from primary vein deposits. Vanadium Corporation of America is the principal producer.

Other sources of occasional production of uranium ore of primary origin are the Boulder Batholith area of Montana and the Colorado Front Range. In the first named, the W. Wilson lease near Clancy, Mont., made several shipments during the year.



Many of the larger operations on the Colorado Plateau are completely mechanized



In Australia, the Radium Hill shaft is down to 750 ft and plans are to deepen it to 2000 ft

In the Colorado Front Range, Fred Schwartzwalder's Ralston Creek Mine in Jefferson County was explored under a Defense Minerals Exploration Administration contract. Under the DMEA program the Minnesota tunnel was driven below existing workings to explore for downward extensions. Several shipments of good grade ore were made from the mine during the year. Exploration was active in other areas in the Colorado Front Range and several operators plan to initiate new programs next year.

South Dakota and Wyoming

In South Dakota and Wyoming the area surrounding the Black Hills is becoming an important domestic producing area. However, total production in the area does not compare with the output of any one of several mines on the Colorado Plateau. No single large mining operation occurs in the area but several have been rather steady sources of production. All ore is delivered to the Commission's buying station at Edgemont, S. D.

Principal producers are the Homestake Mining Co., New Haven and Carlile strip mines in the Hulett and Carlile districts of Wyoming; the Sodak Mining Co., underground Kling-Apland properties in the Aladdin area of Wyoming; the Pictograph Mining Co. at its lease on the Edgemont Mining Co., Gould Mine in Chilson Canyon in the Edgemont district; and the properties worked by Kerr-McGee Oil Industries, Inc., in the Pumpkin Buttes area, Wyo.

Late in 1954 several producers shipped lignitic ore obtained from a number of properties in Harding County, S. D., particularly from the Cave Hills and Slim Buttes areas. Private airborne radiometric surveying discovered thin strata of lignite interlaced with sandstone beds in the

area which contained sufficient uranium to produce material of ore grade. Subsequent prospecting disclosed other deposits of this type in Harding County and adjacent areas in North Dakota and Montana. The material has little or no value as a fuel. It is mined and shipped as uranium ore. At the year's end, Edgemont suspended purchase of this ore pending the determination of its amenability to treatment.

Other Areas

A number of other areas in Wyoming and in New Mexico outside the Colorado Plateau were the scene of prospecting and exploration. Ore production has occurred in many areas in both states, but most of the properties are small and infrequent shippers. The Wind River Basin and Powder River Basin in Wyoming appear to contain sufficient ore reserves to indicate important sources of continuous production.

Considerable interest in prospecting for uranium has been stimulated in California, Nevada, and Washington by discoveries. In California, two recent occurrences are at the Rosamond property of the Verdi Development Co. in Kern County and the Miracle Mine of the Wyoming Gulf Sulphur Corp. The last named made the first shipment of ore produced in California during the year. Exploration and development is continuing at these and other properties in Kern and San Bernardino counties. In Nevada, interesting occurrences are being explored in several counties and development work is proceeding at several properties.

The Spokane Indian Reservation, northwest of Spokane, Wash., was the scene of another interesting uranium strike in a new area. Known as the Midnight mine, a lease has been

granted by the Spokane Tribe and as the year closed a carload of ore was being prepared for shipment. This discovery opens up possibilities of finding similar deposits in the region.

Mining is going forward at the Red Bluff mine of the Sierra Ancha Mining Co. and other properties in Gila County, Ariz. Ore is being stockpiled pending establishment of an ore buying station at Globe, Ariz. Other mining operations are under way in Pima and Mohave counties.

Foreign Developments

The completion of new uranium production facilities, increase in uranium production, and continued exploration activity were significant developments in foreign fields. The Shinkolobwe mine in the Belgian Congo and the Urgeirica mine in Portugal are continuing sources of uranium for the free world.

In South Africa new plants were completed and placed in operation for the recovery of by-product uranium from the gold producing areas of the Witwatersrand by Randfontein Estates Gold Mining Co., Ltd.; Luipaards Vlei Estate and Gold Mining Co., Ltd.; Vogelstruisbuilt Gold Mining Areas; President Steyn Gold Mining Co., Ltd.; and Welkom Gold Mining Co., Ltd. Additional plants are under construction.

Australian Production

Construction of a uranium processing plant was completed at Rum Jungle in the Northern Territory of Australia by Territory Enterprises Pty., Ltd. Ore obtained principally from the White's and Dyson's deposits is being processed. Other deposits in the Rum Jungle area may also contribute ores to the plant. The plant will produce a copper flotation concentrate as a by-product. One of the principal ore deposits contains copper as well as uranium.

Development proceeded at the Radium Hill mine in South Australia and ore is being treated at the new concentration plant at the mine. The Port Pirie chemical treatment plant, to treat the Radium Hill concentrates, is expected to start operating in the first half of 1955.

The Radium Hill shaft is 750 ft deep and provision has been made for deepening to 2000 ft—the deepest known ore presently being 1500 ft. Mining methods follow conventional practice. The concentration process used at Radium Hill combines heavy media separation with flotation.

Exploration by private interests is widespread in Australia and reports indicate a large number of uranium occurrences have been found. Some of these may develop into important

new sources of ore. Of particular interest are the Alligator River district, Northern Territory, and the Mt. Isa-Cloncurry area in Queensland.

Canadian Mining

A number of significant developments took place in Canada during 1954. Deposits are being developed and exploration is continuing with excellent results. The Crown-owned Eldorado Mining and Refining Co., Ltd., sole purchasing agent for raw ores and concentrates, remains the only concentrate producer. However, two privately owned plants are under construction. Eldorado operates at Port Radium on Great Bear Lake, Northwest Territory, and at Beaverlodge, Lake Athabasca, northern Saskatchewan.

The Beaverlodge mill was expanded to handle output from the Ace mine and production from neighboring properties such as the Rix-Athabasca Uranium Mines, Consolidated Nichol-

son Mines, and Nesbitt-La Bine Uranium Mines which are shipping to the Beaverlodge mill. With a total of 11 underground operations in the area, additional producers may start shipping ore at a later date.

A big boost in ore and concentrate production in the Lake Athabasca area is expected when the open pit mine of Gunnar Mines comes into production. Gunnar is building its own leaching plant at the mine which is expected to be operating late in 1955. This will be one of the largest plants on the continent.

In Ontario's Blind River area underground development programs are under way to develop large tonnages of relatively low grade ore indicated by diamond drilling by Pronto Uranium Mines, Ltd., and Algoma Uranium Mines, Ltd. Plans have been announced for the construction of a concentrator on the Pronto properties, expected to be in production by 1956. Similar plants will probably be built

by Algoma at its Nordic and Quirke Lake properties.

Centre Lake Uranium Mines and the adjoining Croft Uranium Mines further explored their large low grade ore bodies in the Bancroft area of east Ontario, revealed by diamond drilling and shallow underground exploration. Exploration by Faraday Uranium Mines and Dyno Mines in the same area indicated additional large low grade orebodies.

Outlook for 1955

Looking ahead, further discoveries of uranium ore are certain to result from activity of private concerns. With continued increase in private activity the Government will direct its activities increasingly toward reconnaissance, geologic and geophysical investigations and research to indicate new areas of potential production. Processing capacity will expand with new plants and additions to facilities.

Magnesium

(Continued from page 129)

able. In addition to this, the commercial use of chromium plating holds promise of bringing magnesium to a great many exposed consumer applications where finish is important.

Increasing awareness on the part of industry of the importance of reducing weight, whether it be that moved by individuals or that moved by motors, is a strong factor in the future of magnesium. The past year has seen a wide acceptance of magnesium in the merchandising field for use in so-called pusharounds or other equipment designed to move material from place to place within the store. In addition to this, the development of a monocoque construction of truck bodies whereby supporting members are eliminated through the structural strength derived from heavy gauge sheets of this light metal is opening an entirely unexplored market in the field of truck body and other structural transportation units. At the present time, the use of magnesium for dockboards has become almost universal, while the impetus given the so-called piggyback shipment of freight by the combined use of trucks and flatcars in turn has lent impetus to another large tonnage user of magnesium—that of portable ramps for car-loading.

Price-wise, 1954 has been good in the magnesium field. The basic ingot price has not changed, though near the year end there was a drop in AZ91b alloy ingot for die casting which amounted to approximately two cents per lb and certain freight adjustments were taken into consideration. Early in the year an adjustment in price that crossed the entire

sheet and plate field was effected, which brought appreciable reductions in cost to a great many users. While certain limited areas were adversely affected by this price change, the vast majority of users gained important price advantages. Needless to say, this shift in pricing was predicated in great part on the added production that was available as a result of the opening of the Madison, Ill., mill by Dow Chemical, but added competitive advantages were offered all those who use sheet and must win their markets from other light metals.

Year Unexpectedly Stable

So far as the industry itself is concerned, it has been an exceedingly stable year. Most firms that started the year, finished it in a position that was sound, though not highly profitable. The promise for 1955, found in

advance orders and increasing inquiries, has created an optimism that indicates a good year ahead. This is substantiated by the current program for the Air Force and the intensified activity on the part of the armed forces to develop and concentrate on strong, lightweight materiel which can be readily transported by air.

Running contrary to the rest of the industry, the use of magnesium for consumer products increased during 1954 and it is now known that several new areas are being explored or market tested. Any one of these may open new volume uses to magnesium.

All in all, though 1954 has not been a "good" year, it has been a "kind" year and the industry stands ready to move forward to expected new highs in non-governmental activity while recovering some of the defense volume lost in 1954 due to the stretch-outs and cutbacks effected.



With the skin on, this 50-ft magnesium hangar weighs only 1440 lbs. It can accommodate the helicopters shown or one of the largest jet aircraft we now possess.



Domestic silver output was principally by-product from copper, lead and zinc mines

Silver in '54

Domestic Production Down Slightly But Outlook for Future Is Bright as World Shortage Looms

By JAMES IVERS
Salt Lake City, Utah

THE passing of Senator Pat McCarran of Nevada, who died from a heart attack at Hawthorne, Nev., on September 28, 1954, is a distinct loss to the cause of silver. He was ever vigilant in his efforts to improve the monetary position of the white metal and always alert in exchanging views with the Executive Branch of the Government where he felt the Treasury and State Departments were being influenced by the British Government to abolish silver (and gold) as money notwithstanding the provisions of the Constitution which stipulate that "The Congress shall have the power to coin money, regulate the value thereof, and of foreign coin . . ." and that "No State shall . . . make any thing but gold and silver coin a tender in the payment of debts." The late Senator believed fervently that it was his duty to assist in guarding carefully these provisions of our basic law, as well as Congressional enactments that provide for silver purchases, and never failed to challenge the views of the advocates of man-

aged currency who were striving to circumvent these declarations of Constitutional and legislative authority.

Repayment of Lend-Lease Silver

Although the silver lend-lease debt of the Netherlands Government is not due until April, 1957, it is worthy of note that this Government in 1954 began its repayment of 56,737,341.25 oz borrowed during World War II. The first shipment reached the Philadelphia Mint in July. The total amount received from the Netherlands during the year was 11,232,233 oz leaving a balance of 45,505,108.25 oz yet to be returned by that Government.¹

Other than Belgium, no other lend-lease silver beneficiary has repaid any

¹ The Netherlands Government in 1954 coined 100 million new silver guilder coins, the first since World War II, which will be placed in circulation in 1955. This silver coinage is the equivalent of approximately \$12,000,000. The Netherlands Mint also produces coins for other countries as well as its colonial possessions.

of the silver borrowed under lend-lease agreement from the United States during World War II. The amount lend-leased to Belgium was 261,333.33 oz, all of which has been returned. This amount plus the 11,232,233 oz of silver returned by the Netherlands in 1954 leaves the total amount of outstanding silver lend-lease indebtedness at 399,320,777.86 oz.

Treasury Acquisitions and Sales

During the past 10 years the United States Mint consumed in subsidiary coinage alone 366,129,521 oz. If we add 13,660,927 oz in the Seigniorage Fund on December 31, 1954, to the uncollected lend-lease silver as of that date of 399,320,778 oz, plus 100,000,-000 oz of potential seigniorage that should accrue to the Treasury from domestically mined silver acquisitions during the next 10 years, we arrive at a figure of 512,981,705 oz of potentially available silver for coinage and industrial sales of seigniorage silver during the next decade. One-tenth of that figure (51,298,170 oz) should be the average amount of Treasury silver available annually for coinage and industrial uses. This calculation carries with it the assumption that all of the silver lend-leased during World War II will be repaid in full during the next 10 years. A further assumption is that our coinage requirements during that period will not exceed those of the past 10 years, which is perhaps too optimistic because of the bright forecasts emanating recently from Washington which, if realized, will in the next five years practically double our national

income. If such prosperity should eventuate, we will need much more subsidiary coinage to service the increased business activities.

From the viewpoint of the world silver situation over the past five years we find that silver consumption exceeded new silver production by 126,600,000 oz. The annual average excess of consumption over production during that period was 25,300,000 oz.

It would appear, therefore, that unless there is a substantial increase in the price of silver in the near future there will not be enough production to meet world coinage and industrial demands throughout the next decade.

In 1954 the Treasury acquired 33,842,180.12 oz of domestically mined silver at 90.5 cents an ounce. Of this amount 10,152,654.04 oz were added to the Seigniorage Fund. The remainder (23,689,526.08 oz) were added to the silver bullion that serves as backing for silver certificates, thereby increasing the issue of silver certificates by \$30,627,173.

The Treasury sold during 1954 1,744.53 oz for industrial use, consumed principally in the manufacture of medals.

Production—Domestic and Foreign

Domestic production of silver in 1954 was approximately 36,582,288 oz, which was 988,550 oz less than in 1953, or a drop of 2.6 percent. Substantially all domestic production was by-product silver, produced largely by copper, lead and zinc mines.

It is estimated that world production of silver in 1954 was about 213,500,000 oz, 150,000,000 oz of which were produced in the Western Hemisphere, or practically 70 percent of the world's total.

Canada, Peru and Bolivia showed slight increases in production last year, while the United States, Mexico and other South and Central American countries as well as countries outside the Western Hemisphere showed slight decreases.

As usual, Mexico led all countries in the production of silver in 1954, although the amount was about a million ounces less than 1953 production.

Imports and Exports

Mexico continued to be the largest supplier of foreign silver to the New York market, approximately 30,000,000 oz, an increase of 14.9 percent over 1953. Peru also showed a slight increase in silver exports to the United States. Cuba showed the greatest decrease, due to the fact that prior to 1954 that country exported large amounts of coin which found its way to the New York market and was absorbed in industrial uses. Cuba's supply of excess silver coin is now exhausted.

Silver imports during 1954 totaled 91,767,280 oz, of which 40,930,609 oz were in the form of refined bullion, 47,504,313 oz in ore and base bullion, and 3,332,358 oz in United States and foreign coin. These figures represent a decrease in imports over 1953 of approximately 7,000,000 oz.

Silver exports from the United States, as usual, were insignificant in 1954, amounting to approximately 3,285,000 oz, about 45 percent going to Great Britain and the remainder to various countries in small quantities.

Coinage

Subsidiary coinage in the United States during 1954 consumed 50,825,550.95 oz, an increase over 1953 of 18.9 percent. No silver dollars were minted during the year; in fact, none have been minted since 1935. The Treasury had on hand as of December 31, 1954, a reserve of 234,000,000 silver dollars. The silver dollar has been growing in popularity steadily



Subsidiary coinage in the United States consumed over 50,000,000 oz

for many years and the increased demand is expected to continue indefinitely. Last year silver dollars in circulation rose from \$209,700,000 on January 1 to \$218,300,000 on December 31, 1954, an increase of \$8,600,000.

The only foreign silver coinage processed by the United States Mint in 1954 was for El Salvador in which 1,446,783.4 oz were consumed.

San Francisco Mint Closes

During the latter part of the year the Treasury decided to shut down the San Francisco Mint, established in 1854, because of the decreased demand on the West Coast for subsidiary and minor coinage. If this move should become permanent, it will mark an important milestone in the history of the United States Mint, although it is not indicative in any sense that the demand for silver coinage throughout the United States has diminished. With modern machinery, improved management and more highly skilled workmanship, plus greatly improved transportation facilities, it

is found to be more economical to consolidate minting operations in Philadelphia and Denver, from which places coinage can be distributed more economically and conveniently.

Seigniorage

The amount of profit silver carried in the General Fund of the Treasury on December 31, 1954, of 13,660,926.9 fine oz was the lowest figure in many decades. At the beginning of 1954 there were in the Seigniorage Fund 49,647,562 oz, and during the year the Seigniorage Fund received 10,182,654.04 oz of profit silver arising from acquisitions of domestically mined silver. This amount is 30 percent of total domestic purchases during 1954, and is the percentage of seigniorage stipulated in the Act of July 31, 1946, that must accrue to the Treasury from all domestic acquisitions, silver certificates having been issued against the remaining 70 percent in the amount of \$30,627,173.

A decision has been reached by the Treasury to consign to the Seigniorage Fund, in addition to 30 percent of the acquisitions of domestically mined silver, all lend-lease silver returned by foreign countries.

The total seigniorage that has accrued to the United States Government from the purchase of all silver acquired for monetary purposes from 1792 to June 30, 1954, reached the fantastic sum of \$2,070,166,138.

Price

The New York market price of 85½ cents an ounce was unchanged during the year. This price has remained constant since February, 1953. The Bank of Mexico is still a potent factor in stabilizing the New York market price of silver, and is always alert to absorb any excess offerings of Mexican silver not readily sold to other buyers.

The London market price in 1954 followed the New York price of silver, in general, but did reveal mild fluctuations over a portion of the year. The lowest price reached in London during 1954 was 71½d. an ounce. The highest price was 74½d. Otherwise there was little change in price on the London silver market.

Substantial amounts of Russian silver reached the London market from time to time during the year. Although the quantity is not known it is reported that "many millions of ounces" reached the market. Apparently the London market was selected rather than the New York market as the place to dispose of Russian silver because the Russians were particularly anxious to utilize its silver for acquiring sterling. At the time of the largest offering of Russian silver on the London market it was

feared that subsequent recurrences would force the world price to much lower levels. However, this event did not materialize.

Authoritative opinion in London is that silver production will not be in excess of world requirements for some time. When it is considered that the world consumption of silver during the past five years has exceeded the world production by 126,600,000 oz and that industrial uses of silver continue to increase, it would seem reasonable to expect a serious shortage of the white metal in all of the industrial countries of the world unless the world price increases sufficiently to stimulate adequate production.

Industrial Uses

The industrial consumption of silver in the United States in 1954 was approximately 85,000,000 oz, a decrease of 20,000,000 oz compared with 1953, but the world consumption of silver in the arts and industries increased in 1954 in practically all other countries except Canada by approximately 9,000,000 oz, the greatest increase, almost 7,000,000 oz, occurring in Western Germany.

Withdrawal of Silver Coins in Britain

The British Mint experienced considerable difficulty in providing enough coin to meet demand in 1951, after the substitution of cupro-nickel for silver coin was suspended in October of that year. The British Coinage Act of 1946 authorized the change-over from silver to cupro-nickel. The plan was to gradually withdraw existing silver coin, melt it and use the resultant bullion to repay its lend-lease debt of 88,000,000 oz to the United States. At the time the Act was passed it was estimated that £118,000,000 of silver coins were in circulation. Even at this late date only £34,000,000 of silver coins have been withdrawn, leaving £84,000,000 still outstanding. During this time, however, the British Mint has minted £60,000,000 of cupro-nickel coin thereby increasing the amount in circulation of cupro-nickel and silver coins to £144,000,000. The British are jubilant over the "profit" derived from the substitution of cupro-nickel for silver coins, but will in time, no doubt, regret their great error of substituting cheap money for precious-metal silver coins.

Bombay Bullion Market

The price of silver in Bombay is quoted in rupees per 100 tolas (equal to 37.5 troy ounces). The silver bars sold in this market vary from .996 to .999 fineness. The price of silver in Bombay prior to 1942 was linked more or less closely with the London price, although restrictions were imposed in

September, 1939 which affected the free movement of silver in and out of that market. With the outbreak of war in the Far East in December, 1941 a sharp rise in the price of silver in Bombay followed in spite of efforts by the Reserve Bank of India to stabilize the price.

By April, 1944 the price of silver in Bombay had risen to 143 rupees per 100 tolas (\$1.15 an ounce) compared with an average of 63 rupees (51 cents an ounce) in November, 1941. Silver lend-leased by the United States to India in the amount of 225,999,903.83 oz began to reach the Bombay market through the Reserve Bank of India in June, 1944. Although 50,000,000 oz of lend-lease silver were sold in Bombay in 1944 and 1945, the price was only slightly affected, and remained relatively high during the remainder of those two years. However, in 1945 the price continued to rise and by May, 1946 reached a new high of 195 rupees per 100 tolas, which is the equivalent of \$1.56 an ounce, an all-time high in terms of United States currency. It was in December, 1946 that the Government of India decided to demonetize half-rupee and quarter-rupee coins and to replace them with cupro-nickel coins, thereby following the example of Great Britain of substituting cheap metal for precious metal in their circulating coinage. However, the people of India, always silver minded, continued to clamor for more of the white metal and by June, 1949 the price rose to a point only slightly less than 195 rupees. Unfortunately in September, 1949, the Government of India reduced the exchange value of the rupee by 30 percent in terms of United States dollars, which reduced the dollar equivalent price of silver in Bombay. The price of silver rose in Bombay immediately following the Korean War in 1950 and although the price in that market in June, 1951 reached an all-time high in terms of rupees (207 rupees per 100 tolas) the new equivalent of the Bombay price in dollars was only \$1.16 an ounce. In March, 1952 following the Armistice in Korea the price of silver declined to 160½ rupees, or only 89.4 cents an ounce. This is a good example of the viciousness of manipulation of exchange rates of foreign currencies.

During World War II the Reserve Bank of India sold in Bombay 186,000,000 oz of silver, and 62,000,000 oz were sold in 1941, 58,000,000 oz were sold in 1942, and 66,000,000 oz were sold in 1944 and 1945. Most of this silver was lend-leased by the United States. In 1949 23,000,000 oz were sold by the bank and in October, 1950 an additional 68,500 oz were sold by the bank on the Bombay market.

In 1918 upon the urgent request of Great Britain, the United States Government sold under authority of the

Pittman Act 200,000,000 oz of silver at \$1 an ounce to India to augment the dwindling supply of silver rupees which the Indian people were demanding for paper rupees. The situation resulting from the shortage of silver rupees was so serious that a revolution was narrowly averted.

The dollar equivalent of the price of silver in Bombay in 1954 varied from 83 cents in June to \$1.02 an ounce in October.

Ambassador Stuart's Report

Since the State Department withheld from publication most of the information contained in official reports of economic and military missions to China during the past 15 years, the public has been without knowledge of other than sketchy findings of these emissaries until our Ambassador to China, Honorable John Leighton Stuart (now retired), published in his Memoirs in 1954 a detailed account of his "Fifty Years In China." His book contains many references to the economic, monetary and military phases of the situation in China and highlights the importance of silver in numerous passages. In one instance he states "The modern-minded younger officers in the Ministry of National Defense felt that if they could have a unified command and coordination of air, water and ground forces they could make it extremely hazardous for the Communists to cross the Yangtze. But more crucial than strategy were silver coins with which to pay the troops. They did not want Gold Yuan, but four silver dollars per month apiece (two U. S. dollars) or even two of these would sustain their morale. Otherwise Communist agents could buy them off with hard money or with mere promises. The government had nearly 300,000,000 U. S. dollars in gold and silver bullion, but most of this was safely in Taiwan as were the ample stocks of munitions."

In another passage Ambassador Stuart states that "If the government intended to continue its military resistance, the Yangtze was the natural barrier. As one of the highly competent younger men in the Ministry of National Defense had described it to me, it was worth 3,000,000 soldiers. He and others of his kind were endorsed by my military and naval attaches in the opinion that with the coordination of ground, naval and air forces and unified command in their Ministry, together with payment of the troops in silver and decent care of them, they could have at least held the river for several months and quite possibly have led the Communists to change their overall policy."

Silver coins are destined to play an important role in the China situation when and if the Nationalist Government successfully invades the mainland.

Mercury Report, 1954

High Prices, Government Guaranteed Floor Spur Production

By S. H. WILLISTON
President
Cordero Mining Co.

THE quicksilver industry in 1954 invoked a considerable amount of public interest, speculation and mystery. At the beginning of the year the price, \$187-\$190, was not materially different from the levels of January 1951 but shortly thereafter delivery of foreign metal slowed to a trickle. Most of the metal from Italy and Spain for 1954 was tied up by a Broadway trading concern for some undiscovered branch of the United States Government. Probably close to 80,000 flasks were taken out of the world supply during the year, leaving only inventories and possibly 70,000 flasks of new production to take care of world requirements.

In July the General Services Administration announced a floor program for mercury to extend for 3½ yr at \$225 a flask, a price, even then, well below the market. This program came more or less as a bolt out of the blue, without any action by Congress or by any members of the industry, and the figure must have been arrived at on about the same basis as President Roosevelt's reported "morning toast and coffee" figure for the price of gold back in the 30's.

For several months well-authenticated rumors as to the new use of the metal, which had caused the price rise, flew thick and fast. By the year's end, however, most of the

speculative interest in mercury had died down due to the lack of any definite statements as to how much additional metal was really needed.

The producing industry in the United States has been awaiting something more definite along these lines without results. The industry still remembers keenly Governmental lack of concern over its future during the 40's and repeated statements by stockpile authorities and Washington planners that the stockpile was in excellent shape and that there was little if any need for concern over domestic production. The bulk of the industry is planning for the next three years on the basis of a \$225 price which, if transferred to other metals, would be the equivalent of 15-cent lead in the lead industry. The higher price is seen as purely a result of what may be a temporary action of some division of the United States Government. While there is reason to expect its lasting at least another six months, on the basis of present information, it is impossible to justify opening new properties which would take several years to pay out on the basis of the higher year-end figure.

One old and one new mine are expected to go into operation in the early months of 1955. The new mine is Sonoma Quicksilver's Paradise property in Nevada where a 100-ton

rotary will handle open pit ore. The old mine is Cordero Mining Company's Horse Heaven Mine in Oregon where a small 25-ton rotary is being installed to clean up the proven ore in this old producer.

Production for the year rose slowly during the first three quarters and fell off somewhat in the final quarter. The largest increase was during the third quarter when a high-grade stope at the Abbott Mine increased production well above the normal rate. Furnace capacity at this property has been doubled. The ore grade is back to about the level of the early part of the year.

Total new United States production for the year 1955 may well run from 400 to 500 bottles per month, about the equivalent of the average output from Cordero or Idria in 1954.

Italian Tonnage Up

For the second year in a row, tonnage produced in Italy increased but the grade of ore declined. This might be considered as evidence that the Italian industry was having difficulties maintaining its average one percent ore. On the other hand, it seems more likely that the higher price of metal had made some ore out of waste and this has tended to pull the grade down. It is reported that a new rotary furnace is being added to the Italian productive capacity which may result in higher output or more efficient operation in the coming year.

The high export tax on mercury from Italy tends to decrease the Italian operators' desire for adding production.

Spain Builds Capacity

Two 100-ton Herreschoff furnaces were installed at the Almaden Mine during 1954 and were reported in satisfactory operating condition at the end of the year. These furnaces, on the basis of rating by the United States mercury industry, are probably capable of handling far more than 100 tpd each if they are pushed. To do so, however, would require considerable additional underground development and hoisting capacity. There are well authenticated rumors that this work is going on and when it is completed the mine will be in shape to handle much larger tonnages of low grade ore, or, if grade is maintained, materially increase production.

During the latter half of the year several new properties were explored in Mexico and numerous plans were made for additional production. It is possible that due to the high tax structure, as well as the requirement for export permits, some of these developments may die on the vine.



Total new United States production for 1955, 400 to 500 flasks per month, may equal average New Idria output in 1954

The Nickel Industry

Free World Production Reached All-Time High. Expansion of Established Producers and New Production Scheduled

ACCORDING to a year-end statement by Dr. John F. Thompson, chairman of the board, International Nickel Co., nickel production by the free world in 1954 will reach an all-time high estimated at 390,000,000 pounds, or approximately 50 percent higher than the pre-Korean 1949 output. The 1954 production is 50,000,000 lb higher than the free world output in 1953. Much of this increase was assisted by government premium prices.

It is expected that over-all production by Canadian producers will surpass any previous year, and will approximate 320,000,000 lb, accounting for over 80 percent of the free world's total. In 1953, Canadian nickel production totalled 286,000,000 lb.

Output of the metal by International Nickel from its own ores during the year will also set a record at about 275,000,000 lb. This high nickel production has been made possible by reason of the completion of certain mining and metallurgical developments climaxing years of planning and research and of the progress made in Inco's underground mining expansion program.

Government stockpiling acquisitions in 1954 absorbed much of the increase in world production and also required increased diversions from industry. On the other hand there was a lessened demand upon industry for defense production. The over-all result was that the supply of nickel to industry for civilian applications was improved. Although progress was made in 1954 in improving the position of civilian users of nickel, complete satisfaction of civilian requirements was still not possible under the prevailing governmental defense and stockpiling schedules.

Price Increased

To assist in offsetting higher production costs, International Nickel Co. of Canada, Ltd., on November 24 increased its price of refined nickel by 4½ cents (United States) per pound. Like increases were also made by the company's United States subsidiary, the International Nickel Company, Inc., and its United Kingdom subsidiary, the Mond Nickel Company, Limited. This brought the export price of electrolytic refined nickel,

from the company's Port Colborne, Ontario, refinery, to 64½ cents (United States) per pound, including 1½ cents United States import duty which is paid by the company. New price schedules were also announced for nickel and nickel alloys in the form of mill and foundry products produced at the plants of its United States and United Kingdom subsidiaries.

INCO-U. S. Contracts

Deliveries of metallic nickel by International Nickel to the United States Government at the rate of 2,000,000 pounds monthly were begun in January 1954, under the terms of a contract signed in May 1953, with the Defense Materials Procurement Agency. Deliveries will total 120,000,000 lb of nickel in the five-year period ending in 1958. These are in addition to the amounts of nickel otherwise provided by the company to the United States stockpile.

In September, announcement was made of the signing by International Nickel of a contract with the General Services Administration of the United States Government to refine certain

nickel concentrates produced by Sherritt Gordon Mines Limited. The contract calls for the delivery of 4,500,000 lb of refined nickel in the period ending August 1955. Performance of this contract is in addition to the scheduled maintenance of International Nickel's present increased annual production rate of 275,000,000 lb of nickel.

Other Producers

Mining and electric smelting of nickel ore at M. A. Hanna Company's property near Riddle, Ore., was started on an experimental basis. The plant was scheduled to produce ferro-nickel at a gradually increasing rate, reaching 8,000,000 lb, contained nickel, per year by the end of 1954. It is planned eventually to expand the plant to produce twice that much yearly.

The mines and mill at Nicaro in Oriente Province, Cuba, operated by National Lead Co., will expand production by 75 percent. The Freeport Sulphur Co. subsidiary, Nicaro Nickel Co., has been working on a new ore deposit at Moa Bay—also in Cuba. It is reported that the Freeport subsidiary will spend about \$55,000,000 for mining and processing facilities at this property.

Nickel Outlook

Based on available information it is estimated that free world nickel production in 1955 should approximate 415,000,000 pounds. It is expected, after satisfying defense requirements and deliveries to government stockpiles under present schedules, more nickel will be available to free world industry for civilian applications in 1955 than was the case in 1954.



Sherritt Gordon's Lynn Lake concentrator exceeded planned output by about 15 percent

TV Goes Underground

Hoistman Can Watch Danger-Point 1200 ft Down Shaft

TELEVISION is looming as an important factor in the industrial world, camera eyes are aiding human eyes in places where worker safety was previously an acute problem. TV is probing and making possible scrutiny of nooks and crannies along production lines which before were inaccessible.

In the Centennial Mine Shaft of the Calumet Division, Calumet & Hecla, Inc., near Calumet, Mich., television cameras are now constantly focused on two horizontal sheaves, located midway between the rails over 1200 ft down the shaft.

There is a long, gradual curve in the shaft at this point, and the sheaves are necessary to prevent the skip ropes from slapping against the rails and timbers.

Before the cameras were installed, a watchman had to stay in the shaft to warn the hoist engineer if the ropes came off the sheaves. Now, an image of the sheaves is relayed to a split-image monitor located at the engineer's station on surface. He is able to watch the ropes and sheaves himself, increasing efficiency and safety, as well as saving valuable time. If a

rope comes off a sheave, the engineer can immediately pull the skip back until the rope returns to its place.

The curved shaft, a rarity in the mining industry, is a result of the restricted property lines of the mine's original owner, the Centennial Mining Co. The curve was necessary so that

the shaft would be located in the center of the company's ore body. This equalized the distances ore had to be transported from either side of the shaft, an important item in the days before underground operations were mechanized.

But through the new magic of television, this curve now presents no particular problem. Throughout industry, TV has become the answer to production problems. It seems destined to play an even greater role in the years ahead.



Image of sheave and skip rope on split-image monitor located at the hoist engineer's station on surface



Gordon Kingstrom, mining captain of the Centennial Mine, points to the television camera and horizontal sheave, located over 1200 ft down the mine shaft



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1955 Coal Show

**Plans Well Advanced for Big Convention and Exposition in
Cleveland, May 16-19**

WHERE are you going to be the week of May 16? If you are one of those responsible for producing the 425,000,000 tons of coal that will be needed this year, you will undoubtedly be at the AMC Coal Show in Cleveland. If you are a miner of metals or industrial minerals and having mining or processing problems—and who doesn't—you will want to be there too. The latest in mining technology will be discussed during Convention sessions and the newest in mining equipment and supplies will be displayed throughout the huge exhibition halls and outside exhibits at the Cleveland Public Auditorium.

As for all American Mining Congress Conventions, the theme of the 1955 Coal Show is, "What is the latest?" The premise on which the Program Committee based its selection of sessions, topics and speakers was, "what will most benefit the large number of mining men who will be in Cleveland for the Show?"

The answer is apparent in the program outlined here. There will be two sessions devoted to continuous mining and its associated problems; two to strip mining; and one each devoted to mechanical mining, roof support, haulage and power, foremanship and maintenance, coal preparation, and safety. At each of these sessions the papers will be presented by outstanding mining men.

The coal industry, having gone through a mechanical evolution, is now well into a period during which it is consolidating its forces to regain its rightful position as the number one

energy source of the nation. Its market has changed and its production pattern is changing. The industry has gone through its worst post-war year, which saw a 14 percent drop in output from the previous year—but during the last quarter of 1954, it bounced back and production in 1955 is expected to be some 10 percent greater than last year. Meanwhile, the industry has not lessened its intensive drive to produce coal at a lower cost and to avail itself of improvements in equipment and operating techniques.

In line with this never-ending search for safer, more efficient coal production, the American Mining Congress is proud that its Coal Conventions and Expositions have always provided the forum where ideas for cost-cutting programs first see the light of day. This year will be no exception and several manufacturers have indicated that they will introduce new units to the industry for the first time. The great exhibition halls of Cleveland's Public Auditorium will be filled to capacity with the latest in mining machinery and equipment with the technical representatives of the manufacturers on hand to discuss the applications of the machinery on display to particular problems in all branches of the industry.

Ladies Invited

All mining ladies are especially invited to attend the great four-day Convention and Exposition. In view of the large variety of colorful and interesting exhibits, it is not surprising that many of the ladies make it a

point to visit the Auditorium to see the Show.

In addition, a special program of ladies' events has been arranged. On Monday at a Welcoming Luncheon, a well-known floral arranger will pass along helpful hints to the homemakers. On Tuesday there will be a Luncheon and Fashion Show, which from all indications will be filled to capacity. A sight-seeing tour of this interesting Lake shore city, with a stop for tea, has been arranged for Thursday afternoon.

Time Out for Fun

This year the traditional Coal Miners' Party is scheduled for Wednesday evening. This will be a special time for fun and relaxation with a fine dinner, a top-notch entertainment program, and plenty of time for music and dancing. Monday, Tuesday and Thursday evenings have been left open for the informal get-togethers and parties that add so much to the enjoyment of the AMC Coal Show.

Application blanks for advance registration and entertainment tickets will be mailed to the industry soon. To save precious time in Cleveland, be sure to fill out and return them promptly. And if you have not made a hotel reservation, do so right away. Send your request for accommodations to the Cleveland Housing Bureau, 511 Terminal Tower, Cleveland, Ohio. Those planning to drive to the show should not overlook the advantages of staying at one of the excellent motels that surround the city. For miners everywhere it's Cleveland in May.

Preliminary Program

MONDAY, MAY 16

10:00 am—Continuous Mining Session

Basic Requirements for Successful Continuous Mining
K. L. KONNERTH, Consultant, Pittsburgh, Pa.

A Complete Continuous Mining System
F. EARLE SNARR, Chicago, Wilmington and Franklin Coal Co.

Maintenance of Continuous Mining Equipment
W.M. E. HESS, Vesta-Shannopin Div., J & L Steel Corp.

MONDAY AFTERNOON—NO SESSION

TUESDAY, MAY 17

10:00 am—Mechanical Mining Session

Mechanical Mining in Thick Seams
R. J. BOWEN, Columbia-Geneva Steel Div., U. S. Steel Corp.

Mechanical Mining in Thin Seams
A. H. MANDT, Stephens Elkhorn Fuel Corp.

Mechanical Mining and Long Hole Drilling a Pitching Seam
G. A. SCHNEE, Philadelphia & Reading C. & I. Co.

Maintenance Cost Accounting
RALPH W. HATCH, Hanna Coal Co.

10:00 am—Roof Support Session

Latest Developments in Mine Roof Bolting
E. M. THOMAS, U. S. Bureau of Mines

Methods and Results With Mine Roof Bolting
E. H. GREENWALD, Boone County Coal Corp.

Methods of Partial and Complete Pillar Extraction
W. F. DIAMOND, Island Creek Coal Co.

Auger Drilling Pillars to Control Mountain Bumps
WOODS G. TALMAN, Coal Div., U. S. Steel Corp.

2:15 pm—Strip Mining Session

Two-Seam Stripping and Overland Belt Haulage
W. M. DUKES, Stonefort Corp.

The Truax-Traer Wheel Excavator
GENE LONG, Truax-Traer Coal Co.

New Improved Truck Designs to Raise Haulage Efficiency
A Panel Discussion by:

R. D. EVANS, Caterpillar Tractor Co.
R. H. KRESS, Dart Truck Co.
A. S. MCCORMICK, Euclid Div., General Motors Corp.
HOYT SMITH, LeTourneau-Westinghouse Co.

WEDNESDAY, MAY 18

10:00 am—Foremanship—Maintenance Session

An Evaluation System for Foremanship and Its Uses
E. B. LEISNERING, JR., Stonega Coke and Coal Co.

Machine Breakdowns Can Be Prevented
HUGH H. FRASER and H. E. HASTINGS, H. H. Fraser and Associates, Ltd.

Industrial Engineering Applied to Coal Mining
T. M. BARRY, Barry and Co.

10:00 am—Haulage and Power Session

Considerations in Designing a Mine Haulage System
STEPHEN KRICKOVIC, Eastern Gas & Fuel Associates

Mechanical Loading into Shuttle Cars
W. L. HUSK, West Kentucky Coal Co.

Mechanical Loading onto Bridge Conveyors
MYRON KOK, Warner Collieries Co.

Mechanical Loading Directly into Mine Cars
JOSEPH JOHNSON, Perry Coal Co.

Use of AC and DC for Underground Power
W. R. MORTON, General Electric Co.

2:15 pm—Strip Mining Session

Latest Anthracite Strip Drilling Practices
J. ROBERT BAZLEY, J. Robert Bazley, Inc.

New Drilling Developments in Bituminous Strip Mining
FORBES CLARKE, United Electric Coal Cos.

The Akremite Blasting Process for Strip Mining
J. A. MINER, Colonial Mining Co.

Auger Mining Correlated With Strip and Deep Mining
FRED O. SEE, Cardoz Corp.
J. M. POINDEXTER, Salem Tool Co.
QUENTIN G. BULLOCK, Compton Inc.

THURSDAY, MAY 19

10:00 am—Coal Preparation Session

Fine Coal Preparation of Illinois No. 6 Seam
EMERY MILLIGAN, Freeman Coal Mining Corp.

Processing Small Sizes for Competitive Fuel Market
J. S. SNYDER and J. E. TOBEY, JR., Blue Diamond Coal Co.

Cleaning and Drying Fine Sizes of Pittsburgh Coal
DAVID G. WERNER, Mathies Coal Co.

Anthracite Recovery From Silt Deposits at Jeddo-Highland
H. R. MIDDLETON, Wilmot Engineering Co.

10:00 am—Continuous Mining Session

Continuous Mining in 42-inch Coal
RICHARD T. TODHUNTER, JR., Barnes & Tucker Co.

Pillar Extraction With Continuous Mining
H. A. QUENON, Eastern Gas & Fuel Associates

Service Haulage for Continuous Mining—A Symposium
Cascade Conveyors

F. R. ZACHAR, Christopher Coal Co.

Extensible Conveyors

M. A. WILLIAMS, Oglebay, Norton & Co.

Portable Surge Cars

W. C. CAMPBELL, Old Ben Coal Corp.

Continuous Mining With AC Power
JOHN STACHURA, Enoco Collieries, Inc.

2:15 pm—Safety Session

Accident Prevention in Coal Mining

A Panel Discussion by: Representatives of Operator Associations, U. S. Bureau of Mines, State Mining Departments and Mine Workers.

Speakers to be announced.



Wheels of GOVERNMENT



As Viewed by HARRY L. MOFFETT of the American Mining Congress

THE 84th Congress, its organization completed, has buckled down to work. Committees on both sides of the Capitol are holding hearings in increasing numbers on facets of the vast legislative program submitted by the President. Since convening, there has been a steady stream of messages flowing from 1600 Pennsylvania Avenue to the Capitol and the lawmakers face a monumental task if they are to approve a major share of the President's program and adjourn early this summer.

Familiar faces have taken over controls in both the House and Senate and in the various legislative committees. Rep. Sam Rayburn of Texas has succeeded Joe Martin of Massachusetts as Speaker of the House while across the Capitol, Senator Lyndon Johnson of Texas is now the Majority Leader and Senator Walter George of Georgia is President Pro Tempore of the Senate. Committee chairmen in both houses for the most part are conservative Southern Democrats and a number of Westerners have taken over the reins of several committees handling matters of interest to mining. In the Senate, the Interior and Insular Affairs Committee is now headed by Senator James E. Murray of Montana, while the same committee in the House is chairmaned by Rep. Clair Engle of California.

The opening days of the present session saw an aura of sweetness and light, with declarations that the new Congress would work in harmony with the President and the Administration. Even at this early date it is evident that the honeymoon will be short-lived, and politics will be the order of the day, as the parties vie for advantage with the voters they must face in 1956.

State of the Union

On January 6 the President personally delivered his State of the Union message and spelled out a major share of his legislative program to the Congress.

He called for continuation of the

present rate of corporate and excise taxes, an extension of the Trade Agreements Act for three years with authority to make further tariff cuts, customs simplification, an increase in the minimum wage to 90 cents an hour, revision of the Taft-Hartley Act, stronger programs for abatement of stream and air pollution, foreign aid continuance, a vigorous stockpiling program, and a two-year extension of the Defense Production Act. He made reference to the need for a strong domestic mining industry and pledged that the Administration will continue to encourage an orderly development of the nation's mineral resources. In urging extension of the Defense Production Act, he called for renewal of the authority to expand production, including exploration loans, long-term purchase contracts, and rapid tax amortization of defense facilities.

The President told Congress that the economic outlook for the country is good and predicted that national output can rise to \$500 million annually within a decade.

Many of the recommendations which he sketched in this message were repeated and amplified in his budget and economic messages.

Budget Reduced

In mid-January the President sent Congress a \$62.4 billion budget, \$1.1 billion less than that requested for the current fiscal year. He estimated revenues at \$60 billion, about \$1 billion higher than in the current year, but still forecast a deficit of \$2.4 billion for fiscal 1956.

The President said that we cannot afford to have any further loss of revenue through reductions in taxes at this time, but expressed the hope that some moderate tax cuts could be made next year. He reiterated this statement in his economic message.

Mr. Eisenhower told Congress that \$953 million would be needed next year for conservation and development of natural resources, a decline of about \$50 million from the present



Washington Highlights

LEGISLATIVE PROGRAM: To Congress

BUDGET: Slashed \$1.1 billion

STOCKPILING: Inquiry initiated

TRADE ACT: Hearings open

TAXES: No change

MINING LAW: Revisions introduced

MINERALS OFFICE: Created by McKay

COAL WAGES: Minimum rate sought

FUELS POLICY: Expected shortly



year. Next year's mineral resource programs call for \$45 million with an additional \$40 million in obligational authority. He praised the work of the Cabinet Committee on Minerals Policy and declared that the Government would use every available means to support a strong domestic mining industry.

The President recommended appropriations of \$18.8 million for the U. S. Bureau of Mines and \$26.2 million for the U. S. Geological Survey, both slightly below funds provided the two agencies this year.

For the stockpiling of strategic and critical minerals and metals the White House urged an appropriation of \$783 million, of which \$522 million is for new obligational authority. In asking for these funds, the President said that procurement of additional minerals under the new long-term stockpiling program will be limited to instances where purchases at favorable prices will serve both to meet the stockpile objectives and to maintain essential domestic production, as in the case of lead and zinc.

Stockpiling Investigation

Congress wants to take a close look at the stockpiling program and its effectiveness in aiding the domestic mining industry. The Senate Interior and Insular Affairs Committee, at its

first meeting, decided to conduct an investigation of the program through a seven-member subcommittee on minerals, materials and fuels, headed by Senator Murray (Dem., Mont.).

This committee is the successor to that headed by Senator George W. Malone (Rep., Nev.), and is composed of Senators Murray, Malone, Long (Dem., La.), O'Mahoney (Dem., Wyo.), Scott (Dem., N. C.), Dworshak (Rep., Idaho), and Barrett (Rep., Wyo.).

Scheduled to appear before the committee and testify on the stockpiling program are a number of ODM officials and representatives of other agencies handling stockpiling functions.

Members of the committee indicated that if they find that stockpiling is not aiding the domestic industry sufficiently they will consider "independent measures" to accomplish that objective.

Trade Act Hearings

Upon the heels of the President's request for a three-year extension of the Trade Agreements Act, Chairman Jere Cooper of the House Ways and Means Committee introduced a bill to accomplish this and to broaden the President's authority to slash tariffs. Hearings began on January 17, with the big guns of the Administration appearing to urge adoption of the President's recommendations.

Secretary of State John Foster Dulles led off, declaring that enactment of the program would provide a strong economic base for mutual defense treaties between the United States and more than 40 other nations. Under sharp questioning he told the committee that the plight of the coal industry in the face of heavy imports of residual oil deserves serious study and that quota restrictions merited careful consideration. Dulles was followed by Agriculture Secretary Benson, Defense Secretary Wilson, Commerce Secretary Weeks, Treasury Secretary Humphrey, and Foreign Operations Administrator Stassen. All endorsed the Act's extension.

Support for the President's program also came from a number of industry and labor spokesmen. But a sharp fight over the measure is in prospect from domestic industries which have suffered from a flood of foreign goods. Representatives of the coal industry are going before the committee to seek a quota restriction on the importation of foreign residual oil, and are being backed in their demands by representatives of the independent oil industry, mine labor and other groups. Spokesmen for the lead and zinc industries and other branches of mining are also expected to express the view that Congress should regain control over tariff matters and

that these industries should be afforded protection in order to maintain a strong domestic mineral mobilization base. The American Mining Congress will support these efforts before the committee.

Tax Rates to Continue

The President's request that existing corporate income tax rates and present excises on autos, liquor, tobacco and gasoline be continued beyond their scheduled termination date, April 1, is likely to get Congressional approval. House Speaker Sam Rayburn predicted that the present rates will be retained. However, a drive is shaping up in Congress to press for an increase in the personal exemptions for individual taxpayers. The drive is sparked by the desire of the new majority party to foster such a cut now rather than wait until next year as suggested by the President. Such a move is likely to become bogged down, for even should it get by the House, the Senate Finance Committee, headed by Virginia's Senator Harry Byrd, is likely to put any such tax cuts in the legislative deep freeze.

Several members of the Ways and Means Committee will also seek to repeal the tax relief on dividend income enacted last year. Fate of this move is in doubt.

The committee has not yet scheduled any hearings on tax legislation and probably will not do so before the Trade Agreements measure is disposed of.

Mining Law Revision

Several measures have been introduced in the House calling for revision of the mining laws. Rep. Hope (Rep., Kans.) has again offered the bill he sponsored last year which would seriously hamper mining development on forest lands. Rep. Cliff Young (Rep., Nev.) has introduced the bill, sponsored last year by Rep. Regan (Dem., Texas), that would prohibit acquisition under the mining laws of deposits of sand, stone, gravel, pumice, pumicite and cinders located on U. S. public lands. The measure would permit the United States to dispose under the Materials Act of 1947, primarily through leasing.

The Hope bill came under heavy fire from the mining industry at the last session of Congress and was pigeonholed in the House Rules Committee, along with a measure by Rep. Wesley A. D'Ewart (Rep., Mont.). The latter bill would have largely removed abuses under the mining laws without disturbing their basic principles. No hearings have as yet been scheduled by the Agriculture Committee, to which the Hope bill has been referred. At this writing it is not known what form efforts to revise the mining laws will take, but

an undercurrent definitely does exist, particularly in the House, for a revamping of the laws to prohibit their abuse by those seeking to gain property rights under pretended or invalid mining claims.

Since the Regan bill was approved by the House last year, it is probable that it may again secure such approval, but it is possible that some amendments may be adopted to prevent inequities.

Minerals Mobilization Plans

Interior Secretary McKay has created an Office of Minerals Mobilization in the Interior Department to implement recommendations made by the Cabinet Committee on Minerals Policy late last year. The new office, which will report to Assistant Secretary Felix Wormser, will be responsible for adequate supplies of minerals and metals, including solid fuels, to meet both civilian and military requirements. Its Director is likely to be Spencer Shannon, one-time official of the National Security Resources Board.

The new office is to: (1) determine the availability of productive capacity and supplies both from domestic and foreign sources; (2) recommend expansion goals and programs; (3) recommend programs to bring about an adequate minerals mobilization base; (4) determine requirements of the mining industry for materials, equipment and transportation; (5) assist in developing stockpiling plans; and (6) formulate standby controls that might be used in the mining industry in the event of an all-out enemy attack. OMM will also cooperate with the General Services Administration in matters involving tax amortization, mining loans, and procurement contracts for minerals and metals.

The President's budget recommendations revealed plans to staff the new office with some 37 persons, with a \$300,000 appropriation for the next fiscal year.

Coal Minimum Wage

Labor Secretary James P. Mitchell has scheduled public hearings for February 1 in Washington on a petition requesting that prevailing minimum wages under the Public Contracts Act be determined by the Labor Department.

In announcing the hearings, Mitchell said that the petition, filed by the United Mine Workers, the Pittsburgh Consolidation Coal Co. and the Pocahontas Fuel Co., showed that minimum wages paid in each area, computed on a portal-to-portal basis, ranged from \$2.105 per hour for Area D to \$2.346 per hour for Area H, with the rates for other areas falling between these figures.

The Department called for inter-

(Continued on page 160)



Personals

Henry Miller has been named superintendent, Buckheart Mine, of The United Electric Coal Companies near Canton, Ill., according to H. D. Pinkney, vice-president of operations. Prior to his coming to The United Electric Coal Companies, Miller was general superintendent for Coleman Collieries Operations in Alberta, Can.

The appointment of **Kenneth F. Farley** as director of smelting and refining headed a year-end list of organizational changes within the Calumet Division, Calumet & Hecla, Inc., Calumet, Mich. All became effective January 1, according to an announcement issued by vice-president and general manager A. S. Kromer.

Charles W. Jilbert, former director of smelting and refining, will re-



K. F. Farley



C. W. Jilbert

main as an advisor on these operations and as a member of the Division Advisory Committee until his formal retirement on June 1, 1955.

Farley, who joined the Division in 1942, was named smelting and refining manager in August. He previously had been assistant controller.

In changes within the Operating Services Division, Arne W. Hill was appointed electrical project engineer, Amos C. Turner was appointed electrical general foreman, John R. Martin joined the industrial engineering staff, and Harry D. Bennetts was appointed maintenance engineer.

Ralph J. Lofquist is president of the newly organized Kentucky Six Coal Co. In addition to his position as president of the new coal company, Lofquist is secretary-treasurer of Pine Valley Coal Co. and a director of World Mining Consultants, Inc. He has long been associated with the coal industry and is well known for

his work as a coal preparation engineer. Prior to organizing the Kentucky Six Coal Co., Lofquist was associated for 24 years with Roberts and Schaefer Co.

Manning W. Cox, chief geologist of American Smelting and Refining Company's northwestern mining department at Wallace, Idaho, for the past two years, resigned January 15 to undertake a tungsten operation in Arizona. Cox was with the U. S. Geological Survey and U. S. Smelting Refining & Mining Co. before joining A. S. & R. nine years ago.

Kenneth Snarr has been elevated from general manager to president of Miners Coal Co., Madisonville, Ky.; Uniontown Coal Mining Co., Uniontown, Ky., and Williams Coal Co., Mannington, Ky. The companies, which turn out 3,000,000 tons of coal annually, reportedly will be consolidated in the near future.

Lawrason Riggs, III, has moved from superintendent of the Indian Creek operations of St. Joseph Lead Co. to resident-manager of Brunswick Mining & Smelting Corp., Ltd., at Bathurst, New Brunswick, Canada. L. W. Castell succeeds Riggs at Indian Creek.

Glenn E. Sorensen, president of the Kemmerer Coal Co., has been named president of the Gunn-Quealy Coal Co. Gunn-Quealy has mining interests in the Rock Springs, Wyo., coal fields.

W. Church Holmes has left his position as metallurgist and mining engineer with the Sunshine Mining Co. to become general manager of the Mohawk mine and mill, in Esmeralda County, Nev.

J. S. Whittaker was appointed general superintendent in charge of operations of Pittsburgh Coal Co. Division of Pittsburgh Consolidation Coal Co. Pittsburgh Coal operates mines in western Pennsylvania.

C. W. Parisi was appointed director of safety succeeding Whittaker. Prior to this appointment, Parisi served as mine foreman at Montour 10 mine of Pittsburgh Coal.

Lone Star Cement Corp. recently announced the election, effective January 1, of J. H. Leikhim as vice-president-finance; Norman Pennieuk as treasurer and assistant secretary and H. E. Green as comptroller. Green succeeds A. C. Harragin, who has retired.

E. D. Wilkins, former assistant to the works manager of the chemicals division, Kaiser Aluminum & Chemical Corp., has been appointed general superintendent of the corporation's bauxite mining, processing and shipping facilities in Jamaica, B. W. I.

After 40 years in the mining industry, **Ralph E. Kirk** retired as manager of raw materials for United States Steel's Tennessee Coal & Iron Division on December 31.

Eugene P. Reed, assistant manager of raw materials, succeeded Kirk.

Kirk had been associated with TCI since 1936, when he was employed as general superintendent of coal mines. He has been manager of raw mate-



R. E. Kirk



E. P. Reed

rials since 1943. From 1930 to 1935, Kirk was general superintendent of the Mahanoy Division, Philadelphia & Reading Coal & Iron Co. He joined TCI after one year as safety director of Philadelphia & Reading.

Reed came to TCI in 1948, as a special engineer in the Ore Mines & Quarries Works. He was advanced within six months to superintendent of the Muscoda Division of that works. In 1950, he was promoted to assistant to the general superintendent of the Ore Mines & Quarries Works. He became assistant to the manager of raw materials in 1952, and assistant manager the following year.

F. M. Hamilton, who had been supervisor of agglomeration research at Jones & Laughlin Steel Corp.'s Ore Research Division Laboratory, Negaunee, Mich., has been appointed to a similar capacity at J. & L.'s New York Ore Division, Star Lake, N. Y.

At the same time it was announced that **Alton R. Eshbach** had been appointed chief accountant of the New York Ore Division. Prior to his appointment, Eshbach was a senior auditor in the Auditing Section of J. & L.'s General Office in Pittsburgh.

At the 25th annual meeting of the Illinois Coal Operators Association held in Chicago, December 15, A. H. Truax was elected president of the association and Fred S. Wilkey, secretary.

Charles R. Kuzell stepped up from general manager to vice-president in charge of Western operations of the Phelps Dodge Corp. on January 10. He was succeeded as general manager by Walter C. Lawson, who had been his assistant since 1952. Both men will have their headquarters in Douglas, Ariz.

Kuzell, a graduate of the Case School of Applied Science, was engaged in metallurgical work for the Anaconda Copper Mining Co. for eight yr. before going to work for the United Verde Copper Co. at Clarkdale in 1918. He was general superintendent of that company until it was acquired by Phelps Dodge in 1935.

In 1944 he moved to Douglas as consulting metallurgist and director of labor relations. In 1946 he was promoted to assistant general manager and then was named general manager in 1952.

Lawson, a graduate of the Michigan School of Mines, entered the employ of Phelps Dodge at Ajo as a mining engineer in 1926. He was transferred to the Morenci branch in 1937 as chief mine engineer. In 1942 he became mine superintendent at Morenci and in 1946, was promoted to general superintendent. Two years later he became manager of the New Cornelia branch and in 1951, was advanced to the general offices in Douglas.

E. H. Riechl, director of Research and Development Division of Pittsburgh Consolidation Coal Co. has announced the appointment of John A. Phinney to the position of research manager.

Alton K. Guard, formerly project engineer, Morrison-Knudsen Co., Inc., Soda Springs, Idaho, is a geologist with Boyles Bros. Diamond Drillers, Salt Lake City.

Kuno Doerr, Jr., manager of the East Helena, Mont., plant of the American Smelting & Refining Co. since March 1, 1947, became manager of the company's Garfield, Utah, plant January 1. He was succeeded at the East Helena plant by Joseph



C. R. Kuzell

T. Roy, formerly plant superintendent there.

Doerr was employed at the Garfield plant in 1927 as a chemist. In 1940 he was made assistant superintendent of the plant and in 1941 was appointed assistant manager of the Utah Department of A. S. & R. He went to East Helena in 1947 as manager.

Roy joined A. S. & R. as a chemist at the East Helena plant in 1929 and in 1933 was advanced to metallurgist there. In 1936 he became assistant superintendent, and in 1942 was named superintendent of A. S. & R. lead smelter at Selby, Calif. He returned to East Helena as plant superintendent in 1948.

H. E. Mauck, general superintendent of Olga Coal Co., Coalwood, W. Va., has been elected president of the Focahontas Electrical and Mechanical Institute.

The New Jersey Zinc Co. recently announced the appointment of W. C. Dunlap as manager of purchasing to succeed W. J. Lee who retired December 31. A. E. Turner becomes assistant manager of purchasing.

Adrian C. Dorenfeld, Associate Professor of Mineral Engineering, has resigned from his position at the University of Alabama to join C. F. Braun & Co., Alhambra, Calif., as head of the Mineral Dressing Department.

— Obituaries —

O. E. Fox, 88, retired mining engineer, died in late December after a short illness. Mr. Fox, brother of author John Fox, Jr., had prospected much of the coal lands in Harlan County, Ky., before railroads entered that part of the country. He served as mining engineer for many of the coal companies in the field, 20 at one time.

George S. Brackett, 79, former president of the Northern West Virginia Coal Association, died at his home in Fairmont, W. Va., November 28. Mr. Brackett resigned from the coal association presidency in 1952, but was retained as labor consultant until his death.

Robert Dale Johnston, 47, engineer for Utah Copper Division, Kennecott Copper Corp., and one-time Bingham mayor, died November 10.

Francis H. Maloney, 60, an executive of the Philadelphia and Reading Coal and Iron Co., died in Bryn Mawr Hospital, January 2.

Mr. Maloney was born in Schuylkill County, Pa., in 1894. His entire business career was spent in the coal industry. He first joined Philadelphia & Reading in 1927 as secretary to the president and later became assistant to the vice-president.

Harry S. Matthews, Jr., 52, sales vice-president of Pittsburgh Consolidation Coal Co., died at his home in Pittsburgh, December 19 after a long illness.

Born in 1902 at Stratford, England, Mr. Matthews was a graduate of the University of Pittsburgh. He first joined a predecessor company of Pittsburgh Consolidation in 1927 and entered sales work for the Pittsburgh Coal Co. In successive periods he served as sales agent for the Pittsburgh District Office, sales manager

Pittsburgh-Baltimore District, and Cleveland sales manager. In 1938 he became assistant general sales manager.

After the formation of Pittsburgh Consolidation Coal Co. in 1945, he became vice-president of the Pennsylvania Division. He assumed the post of sales vice-president of the parent company in 1949.

John Theodore Parker, 53, manager of Inland Steel Co. coal properties at Wheelwright, Ky., died suddenly January 12 in Cleveland, Ohio, of acute leukemia.

Mr. Parker was born in Fayette City, Pa., February 17, 1901. He attended Carnegie Institute of Technology and Harvard School of Business. He was first employed by Inland in 1926 as a mining engineer at Indianola, Pa., but four years later was transferred to its operations at Wheelwright where he was successively

mine engineer, mine superintendent and general superintendent before becoming manager just one year ago.

Long prominent in coal industry organizations, Mr. Parker was at his death, a member of the mining development committee of Bituminous Coal Research and also of the operating committee of the Bituminous Coal Operators Association. He was a member of the program committee for the 1955 American Mining Congress Coal Convention and had presented many papers before that body. He was a past president and director of both the Kentucky Mining Institute and the Big Sandy-Elkhorn Mining Institute.



NEWS

and VIEWS



Eastern and Central States



C. W. & F. Sold

Announcement has been made of the acquisition by Materials Service Corp. of Chicago of substantially all the stock of the Chicago, Wilmington & Franklin Coal Co. The transaction involved approximately \$12,000,000.



George B. Harrington (left) former president C. W. & F., shows Col. Henry Crown (right), chairman of the board, Materials Service Corp., around the C. W. & F. property

coal production in the State of Illinois and ranks with the largest in the country. The two coal companies have several of the country's most modern and efficient coal mines and the two largest "Air Washing" plants.

Col. Henry Crown, chairman of the board of the Materials Service Corp., has stated that his plans are to double production in the No. 3 mine of C. W. & F. located at Waltonville, Ill. C. W. & F. has two mines in Franklin County and one in Jefferson County from which it produced about 3,500,000 tons in 1954. The company formerly operated five other mines in Southern Illinois as well as mines in Central and Northern Illinois and in West Virginia.

Freeman has, at present, three operating mines—two in southern Illinois and its new Crown mine in central Illinois. This company also produced about 3,500,000 tons of coal in 1954. President of Freeman is Stuart Colnon. Frank Nugent is executive vice-president.

George B. Harrington, president of C. W. & F. for over 40 years, becomes a director and vice-president of Materials Service Corp. Harrington, rightly known as a "dean of the coal mining industry," has pioneered in modern coal mining methods in this country. He has given generously of his time to the coal industry's economic-legislative affairs and is at present a director and member of the executive committee of the American Mining Congress.

Materials Service Corp. also owns Freeman Coal Mining Corp. The combined production of C. W. & F. and Freeman constitutes the largest

W. Va. Coal & Coke Sells Mines

The entire mining operations of the West Virginia Coal & Coke Co. in Logan County, W. Va., were purchased in mid-December by the Omar Mining Co. The purchase includes two mines, No. 5 at Omar and No. 15 at Stirrat. Another mine, No. 18 at Stirrat, is on a standby basis.

West Virginia Coal & Coke still controls undeveloped deposits of coal in northwestern West Virginia, but is not actively engaged in mining operations.

Maintain Safety Record

Fatal mine accidents in Kentucky last year averaged less than one for each million tons of coal produced, according to A. D. Sisk, chief of the State Mines and Minerals Department.

Sisk said the State mined 58,000,000 tons of coal in 1954 with only 54 mine fatalities. This was the lowest number since 1912, although in 1949, 1950 and 1953 the average was also less than one fatality per million tons mined.

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R&P Joins Vitro for U-Ore

Vitro Corp. of America and Rochester & Pittsburgh Coal Co. have formed a jointly-owned subsidiary to be known as Vitro Minerals Corp., according to an announcement by their presidents, J. Carlton Ward, Jr., of Vitro and Charles J. Potter of R. & P.

The new corporation has been formed for the exploration, drilling and mining of uranium claims held by the two companies. Open-pit mining of extensive claims in the Gas Hills area of Wyoming, near Riverton, which adjoin the well-known Lucky Mc Mine, are expected to be started in late February.

Other uranium ore interests included in the new Vitro Minerals holdings are near the San Rafael Swell district of east central Utah, including the Daye-Davis and Desert Queen claims and a nearby Utah school section. In addition the company will share in claims in the Blind River district of northern Ontario, Can. More claims are under consideration.

Vitro Corp. and Rochester & Pittsburgh will each have a 50 percent interest in the new corporation, formed in Delaware, and an equal number of directors. The officers

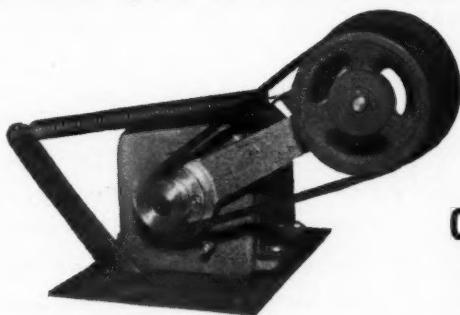
from Vitro will include J. Carlton Ward, Jr., chairman, William B. Hall, vice-president, Raymond T. Ruder, treasurer, and William H. Denne, Jr., secretary. R. & P. officers will include Charles J. Potter, president, Darwin R. Pickard, controller and H. Vernon Fritchman, assistant secretary. Jack O. Horton, now manager of the ore department of Vitro Uranium Co. of Salt Lake City, has been named general manager of Vitro Minerals.

American Zinc Activity

American Zinc Co. of Tennessee, wholly-owned subsidiary of the American Zinc, Lead & Smelting Co., has entered into a two-year contract with the Defense Minerals Exploration Administration for sharing costs on a 450,000-ft diamond drilling program between its South Friends Station and Grasselli mines near New Market, Tenn.

Ten diamond drill rigs are now in operation in the area and results to date have been encouraging. Howard I. Young, president of the parent firm, has reported to stockholders in a quarterly report.

Sinking of a new shaft in the southeast Jefferson City, Tenn., district has also been started by the company. The shaft is expected to be completed early in 1956.



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That's a Lot of Cover

In October 1954 a 46-cu yd shovel moved 1,727,606 cu yds at the Eastern Ohio stripping operations of the Hanna Coal Co. Division of Pittsburgh Consolidation Coal Co. All of the yardage is based on overburden in place. In making the October record, the shovel travelled 4.68 miles. Figures show that the shovel made a productive pass once every 51 seconds. Average height of the high wall was 41.95 ft with a maximum of 83 ft. The machine operated 95.03 percent of available operating time.

During the same month a new record was established in highwall drilling, when in one shift 1064 ft of drill-hole was put down. In November this record was broken when 1200 ft was drilled in a 7½-hr shift.

Fight Gas Storage

According to press reports, in a suit to obtain a restraining order to prevent the storage of natural gas from Texas in wells in Morgan and Jefferson townships, Greene County, Pa., three Pittsburgh area coal companies recently denied that the gasaries accurately defined or that the

storage wells could have their bound-coal companies had ever agreed to the storage of the gas in areas where their mines are located.

Previously the Equitable Gas Co. of Pittsburgh had claimed that the Pratt Pool, where the storage wells in question are located had been completely charted and that the storage wells constituted no hazard to mine workings in the vicinity.

Coal companies involved were Emerald Coal Co., W. J. Rainey Coal Co. and the Republic Steel Co.

To Roll Their Own

The American Brass Co., subsidiary of Anaconda Copper Mining Co., will soon construct an integrated aluminum mill on the outskirts of Terre Haute, Ind., to cast ingots and billets; roll sheet and strip and extrude tubes, rods and special shapes, according to a joint announcement by ACM President Robert E. Dwyer and Arthur H. Quigley, chairman of the board of American Brass. According to the statement the Terre Haute fabricating facility will be a logical extension of Anaconda's entry into the aluminum field. In 1953 the Anaconda Aluminum Co. started construction of a new alu-

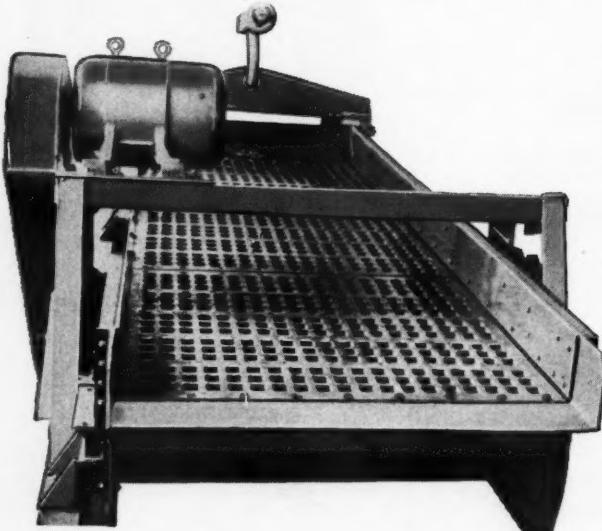
minum reduction plant at Columbia Falls, Mont. This will be completed about the middle of 1955. Eventually, it will turn out 60,000 tons per year of ingot aluminum. The requirements of the American Brass Co. and Anaconda Wire & Cable Co. will be obtained from this source. American Brass has been producing relatively small quantities of aluminum sheet and strip at Torrington, Conn.

The new plant will be built on a 315-acre site in Otter Creek Township, just four miles north of Terre Haute center. As soon as engineering plans are completed, ground will be broken for the new mill which, together with a separate office building, will cover 500,000 sq ft. Construction cost will be about \$25,000,000. The building program will be under the supervision of Wilbur Jurden, chief engineer for ACM.

It was also announced that to eliminate any possibility of stream pollution, special consideration will be given to treatment of sewage and industrial waste from the mill before it is discharged into Otter Creek.

James F. Ackerman, currently serving as vice-president of the American Brass Company's Torrington plant, will be in charge of aluminum fabricating at Terre Haute.

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Ships to Haul Gypsum Rock

Melvin H. Baker, chairman of the National Gypsum Co., announced in January that two 15,000-ton cargo vessels are being built to the company's specifications in Emsden, Germany.

"They will be the largest ever to have operated in the gypsum industry and will be used to transport gypsum rock from our new quarry near Halifax, Nova Scotia, to our plants at New York, Baltimore and Savannah," Baker said.

Establish Warren Lectures

Dr. Louis A. Panek of the Applied Physics Branch of the United States Bureau of Mines has been selected to give the Warren lectures at the University of Minnesota School of Mines



Louis A. Panek

and Metallurgy for three months beginning January 3, 1955. The Warren lectureship was established by Mrs. Alice R. Warren-Gaarden, a former member of the University of Minnesota Board of Regents, in memory of George

Warren and his son, Frank M. Warren.

The Warren lectureship was established to promote effective teaching and education in the mineral industry field by bringing outstanding American and foreign lecturers to the University.

Dr. Panek was selected to give the Warren lectures because he is an authority on the design of mine openings and has been actively engaged in the research of mining methods for many years.

Clean Streams

Planning to prevent steam pollution at its new coal development at Clifftop, W. Va., has brought praise to Royalty Smokeless Coal Co. from the West Virginia State Water Commissioner's State Conservation Commission.

The Water Commissioner issued a permit to Royalty Smokeless to install a coal preparation plant at Clifftop on a tributary of Mann's Creek which provides fishing and swimming water for Babcock State Park. The permit was granted only after convincing proof was submitted that the coal development would not damage the recreational development at the State Park.

An amendment to the State's anti-pollution laws passed by the 1953 State

legislature provides that a permit must be obtained from the Water Commission for any new industrial construction or expansion that could add pollutants to the water.

Washery water at the new plant will pass through screens and cyclone thickeners to recover as much of the coal fines as possible. Then the water will go through three settling ponds where it is expected about four tons of material per operating hour will be trapped. Most of the solids will be recovered in the first pond, with any additional fines captured in the second. Water from the third pond will be pumped back to the plant and used over again in the washing process.

First Synthetic Mica Plant

The world's first synthetic mica plant is under construction at Caldwell, N. J.

A new company, the Synthetic Mica Corp., is scheduled to begin production early in 1955, according to Jerome Taishoff, president of the Mycalex Corp. of America, the parent firm. Estimated annual output of the new plant will be 1000 tons of high grade synthetic mica, about 5-10 percent of the nation's current requirement.

The need for developing a local

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source of mica was recognized immediately after World War II when teams of U. S. technicians went to Germany to find what the Germans had learned about the synthesis of mica.

Eventually the U. S. Government took a hand in the work, and the project was assigned to the Bureau of Mines, Electrotechnical Laboratory at Norris, Tenn. The Bureau of Ships, Office of Naval Research, National Bureau of Standards and the Signal Corps lent their assistance. In March 1953 the Mycalex Corp. of America, which produces electrical insulating products using high grade natural mica, entered the Tennessee project under a cooperative agreement with the Bureau of Mines.

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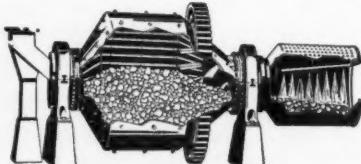
Increase Work Time

Employees at all Oliver Iron Mining Division operations on the Mesabi range and at Ironwood, Mich., returned to a five-day, 40-hr workweek starting January 3. The new work schedule replaces the four-day, 32-hr workweek which had been in effect at most of these Oliver operations since October.

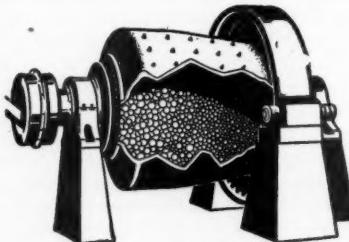
At the same time R. T. Elstad, president of the U. S. Steel Mining Division, announced that 440 miners

equally divided between Oliver's Hibbing-Chisholm District and Virginia-Eveleth operations and who were on a lay-off status were to be recalled to work. The Division expects to add more men to its work force when the ore shipping season opens next spring.

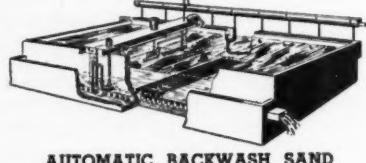
Work at Oliver's mines continues at a rapid pace stripping overburden, repairing beneficiation plants, equipment and facilities all in preparation for the coming ore mining season.



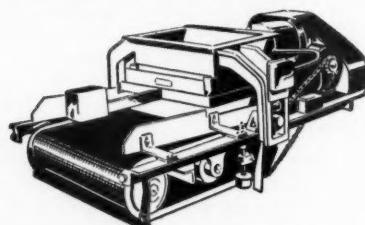
CONICAL SCRUBBERS



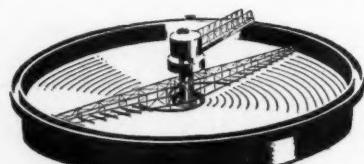
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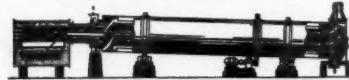
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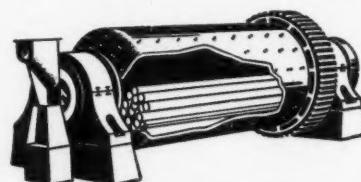
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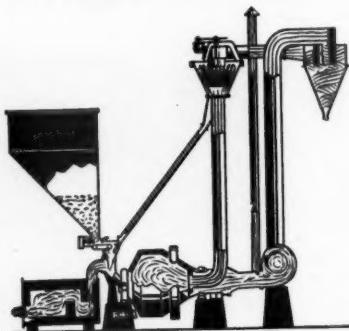
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Novel Steam Supply

A switching engine of the Norfolk & Western Railway was used to provide the steam to operate surplus facilities at the Olga No. 2 mine of the Olga Coal Co., Caretta, W. Va., during the late fall and early winter.

When it became necessary to replace obsolete boilers at the mine, the company borrowed the locomotive from the N.W. A line was laid from the main steam line at the mine to the locomotive, which was parked on a sidetrack, and connected to the engine's boiler. Although the locomotive would operate at a pressure of 90 psi, Olga operated it far below that, using only partial throttle at 45 psi.

The two old boilers, rated at 250 hp, have been replaced by two new 300-hp boilers.

Two P&R Subsidiaries Merge

The Philadelphia and Reading Coal and Iron Co. announced January 6, a consolidation of two of its subsidiary companies in New York City. The two businesses, formerly conducted by Streat Coal Co., Inc., and Chester Operating Co., Inc., have been merged, according to the announcement, into Reading-Sinram-Streat Coals, Inc.

The merger was effective January 1, 1955, and no change in personnel was involved.

Cement Expansion

The Lone Star Cement Corp. has announced a multi-million dollar program for remodelling and enlarging plants at Nazareth, Pa., Greencastle, Ind., and Bonner Springs, Kans. Actual construction is now under way on this program which will increase the annual production capacity of the Rhodes Star by 1,660,000 bbl to a total of 35,660,000 bbl of cement a year for the 18 plants in the system. An additional kiln is to be added at each of the three plants together with necessary auxiliary equipment. The program at the Nazareth, Pa., plant also involves construction of a new crushing plant, a raw and finished grinding installation, additional raw blending bins and an electric precipitator system.

Greencastle construction includes a coal mill in addition to the finish mill, enlarged storage and loading facilities and power transmission improvements.

At Bonner Springs a new ball mill will be installed as well as a coal mill, a clinker grinding mill and additional power distribution equipment.

This is Lone Star's largest expansion program since the construction of its new plants at Lone Star, Va., and Marynel, Tex., and the plant at Aratu, Brazil. Since the close of World War II, productive capacity of the Lone Star system will have increased by 42.6 percent or a total of 10,600,000 bbl a year.

Add to Cleaning Facilities

Contracts have been closed for improvements of preparation equipment at two Nicholas County, W. Va., coal mines.

Johnston Coal & Coke Co. has closed a contract with Fuel Process Co. for an addition to the cleaning facilities at the Crichton No. 4 mine. A 60-in. addition to present Belknap coal washing vessel will be made. The new system will wash 180 tph of 8 by 1½-in. coal.

Coal River Mining Co., Hookersville, W. Va., has also concluded a contract with Fuel Process Co. for a new Belknap coal washing unit. The capacity of the new unit will be 200 tph of 5 by ½-in. washer feed.

Mexico Refractories Expands

J. B. Arthur, president of the Mexico Refractories Co., has announced the purchase of the assets of the Niles Fire Brick Co., Niles, Ohio. Included in the sales were extensive property holdings in Ohio, Pennsylvania and Kentucky where fire clay and silica deposits are located.

Move 900-Ton Dredges

Steep Rock Iron Mines, Ontario, Can., plans to move its two mammoth dredges overland without tearing them down. Each dredge weighs 900 tons. The dredges will be moved two miles—from the "A" orebody at the Hogath mine to the "G" orebody. Removal of 50,000,000 cu yds of overburden from the "A" orebody has been completed.

To Build Agglomerating Plant

Alexander C. Brown, chairman of The Cleveland-Cliffs Iron Co. Board of Directors, announced December 29 that the McDowell Co. of Cleveland, contractors and engineers, specialists in the field of design and construction of iron ore beneficiation plant, has been awarded the contract to construct an agglomerating plant for its Republic mine. This 2000-tpd plant will pelletize the high grade iron ore concentrates produced from the jasper formation by the so-called up-draft traveling grate process.

The plant will be located on the main line of the Lake Superior & Ishpeming Railroad at a site a few miles west of the port of Marquette, Mich. Construction will commence shortly.

The Republic mine, which is scheduled for production late in 1955, is Cleveland-Cliffs' second venture in the development and concentration of Michigan's iron bearing low-grade (jasper) hematite. The first was the Humboldt mine which went into production early in 1954. The initial production of the Republic mine and

plant is estimated at 500,000 tons per year. This is about twice the production rate of the Humboldt plant.

McDowell engineers have been in consultation for many months with Cliffs engineers and operators in developing a plant design tailored to the requirements of the Cliffs material (jasper) in Michigan's Upper Peninsula.

Two very unusual features being incorporated in this pelletizing plant are termed "firsts" in iron ore beneficiation. One of these, named "Ball-

Well Flying Saucer," an agglomerating disc, is presently being fabricated by the Wellman Engineering Division of McDowell Co. Another is an up-draft traveling grate capable of producing 2000 gross tons of pellets daily.

Cliffs management points to these developments as important steps they have taken to strengthen their company's competitive position in the rapidly growing field of producing concentrates from low iron bearing rocks.



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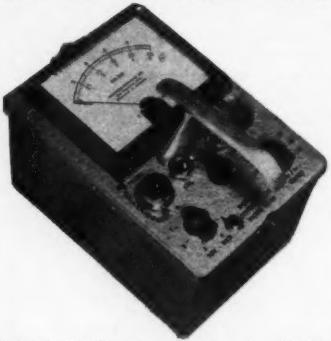
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North Carolina Mica Find



Minerals Processing Co. is increasing its facilities to sheet 2500 lb of black mica per day

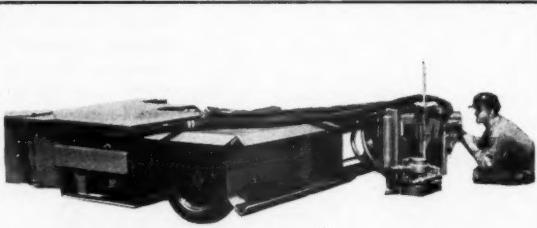
One of the biggest "strikes" in the recent history of domestic mica mining has been made in the southwestern corner of North Carolina in agricultural Macon County which borders on Georgia and South Carolina.

The mining operations are under the direction of the Minerals Processing Co. of LaGrange, Ga.

Frank Siersma, president of Minerals Processing Co., reports that outside experts estimated the property to contain a large tonnage of good quality block mica.

The company has been developing

the property for several months. "We knew it would yield mica, but the quantity and quality far exceeded the original estimates of our geologists," Siersma continued. "When we first started sinking the Rose Creek shaft, we had planned a sheeting operation to handle an expected output of about 500 lb of block mica per day. As the shaft was sunk deeper, the mica started hardening up and the blocks became progressively larger. We're now set up to handle 1500 lb per day, and are rapidly increasing our facilities to sheet 2500 lb per day."



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Western States

Colorado Silver Strike

Burke-Martin Mines Inc. has reported that a silver strike was recently made in Summit County, Colo. The announcement was made by Thomas E. Martin, vice-president of the company. Martin stated that recent development of the old Silver Wing tunnel, six miles southwest of Montezuma, has encountered ore containing lead, silver and gold.

The ore was found in a vein three ft wide, located in the center of a larger vein of silver-zinc ore. Shipments are being made to Leadville Smelter of the American Smelting & Refining Co.

Deepen Pine Creek Shaft

Deepening of the two-and-a-half compartment main shaft at Sidney Mining Co.'s Pine Creek operations is now under way. The progress is under a Defense Minerals Exploration Administration contract approved last September.

Work was started from the sump, 95 ft below the 1700 level, after a relay pocket had been built on the 1700. The 600 ft of shaft provided for in the contract is expected to take about ten months to complete.

Lateral exploration on the new 2300 level will follow. It will include 4075 ft of drifting and 12,000 ft of diamond drilling at a horizon believed to be below the 500 to 600-ft barren zone which, according to geological evidence, exists in that part of the Pine Creek district in Idaho. Chances for new ore shoots below that zone are believed to be good.

Titanium Find in Mexico

Republic Steel Corp. has proved up a large body of rutile (titanium) ore on a 7-mile long by 1½-mile wide mineralized area in the State of Oaxaca, Mexico. The deposit is about 30 miles from the city of Puerto Angel on the Pacific Coast.

Last April, Republic acquired its first claims in the area after Donald Gillies, well-known mining consultant, prospected the area and came to the conclusion that rutile outcroppings led to an orebody of great size. Gillies was assisted in this work by Ward Broadfield and Willis Seaman. Broadfield has since been named general

manager of the Mexican rutile project.

Late in December Republic started placing orders for mining and concentrating equipment. Production is expected to get under way during 1955, with the plant producing 2000 tons of rutile concentrates a month by January 1956. Concentrates will be shipped by water from Puerto Angel to U. S. processors.

The rutile ore lies in three bands, the first being about 500 ft from the summit on an 8500-ft mountain which is part of the Sierra Madre chain. The ore will be crushed to 40 mesh, then milled to 60-80 mesh before spiral separation. Perhaps the greatest job facing the steel company is the building of passable roads into the mine site.

Stake Dakota Lignite Claims

It has been reported that prospecting activity has become moderately intense throughout western South Dakota and southwestern North Dakota since the recent discovery of uraniferous lignite and sandstones in the area. Court House records in Hardin County, S. D., reveal that over 3800 claims have been staked on about 79,000 acres of public land.

This activity is the result of the discovery of the first commercial grade of uranium ore deposits in North Dakota and the discovery of commercial grade lignite ore in Hardin County, S. D. The principal deposits are located in the Slip Buttes and Cave Hills area of Hardin County.

N. J. Zinc, Texaco to Explore

New Jersey Zinc Co. and the Texas Co. have announced they will undertake uranium exploration activities in the Colorado Plateau area and other mineralized regions of Western United States. The exploration work will be conducted jointly by the two companies at the present time. Should a uranium discovery be made of sufficient size to justify mining, a separate company may be formed to do work, it was announced.

1955 Mining Convention— Metals and Industrial Minerals

L. J. RANDALL, president, Hecla Mining Co., Wallace, Idaho, has accepted the post of National Program Committee Chairman for the American Mining Congress Convention in Las Vegas, Nev., October 10-12, Roy A. Hardy, Chairman of AMC's Western Division, has announced.

Chairman Randall will appoint State and District Program Committee Chairmen to aid in formulating plans for a comprehensive program, which will cover the major economic, legislative and operating problems in the mining and processing of metals and industrial minerals. A full and interesting schedule of social events is being arranged for the mining men and ladies who will attend.

Mining men throughout the country will be asked to suggest topics and speakers. These suggestions will be studied at a meeting of the State Chairmen in June to assure a well-rounded, topnotch program.

Hotel reservations will again be



L. J. Randall

handled by a Housing Committee, and reservation blanks will be mailed out to the industry in March. Meanwhile requests for accommodations may be addressed direct to Las Vegas Housing Committee, Las Vegas Resort Hotels Association, P. O. Box 1750, Las Vegas, Nev.

Uranium Ventures Ship Ore

First truck load of uranium ore from its Waterfall group of claims in Dry Valley, Utah, has been shipped to the U. S. Vanadium Ore Buying Station, by Uranium Ventures, Inc., according to Roger Conrow of the company. The ore represents the first production resulting from a 250-ft shaft sunk by the company.

Hecla to Explore Uranium Properties

Hecla Mining Co. has made an agreement with the U. & I. Uranium, Inc., of Kellogg, Idaho, for the exploration and development of its Radon and Hot Rock properties in the Big Indian Mining District, south of Moab, Utah. L. J. Randall, president of Hecla, said in a letter to stockholders.

The Radon property consists of a group of 10 claims which have been partly explored, while the Hot Rock property, still unexplored, consists of 35 unpatented mining claims.

Montana Firms Explore

Two Montana mining firms have recently concluded exploration contracts with the Defense Minerals Exploration Administration. A contract for lead-zinc-copper exploration work in Jefferson County was signed by Elkhorn Consolidated, Inc. Boss Mines, Inc., will undertake a lead-zinc exploration project in Cascade County.

The government agency will provide matching funds for half the costs of each project and will be repaid from royalties on production.

Wheels of Government

(Continued from page 149)

ested parties to submit views as to the prevailing minimum wages in the bituminous coal industry, and as to whether a single determination applicable for all of the area in which the industry operates, or a separate determination for each of the several geographical areas should be made.

Fuels Policy Study

As this is being written, the Cabinet Committee's report on fuels and energy policies is expected to be considered by the full Cabinet shortly and an announcement made as to its contents.

Several meetings of the committee were held during January to consider recommendations of a task group, headed by James F. Brownlee, but disagreement arose over some of the task group's proposals. This delayed submission of the report to the White House.



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Safety Award

The National Safety Council, at its annual meeting in Chicago, awarded its highest honor, the N.S.C. Citation for Distinguished Service to Safety, to A. H. Zeilinger, safety superintendent at the Colorado Fuel and Iron Corporation's Pueblo plant.

Zeilinger has been instrumental in the achievement of CF&I's outstanding safety records throughout the years.

Climax Diversifies Further

As another step in its diversification program, Climax Molybdenum Co. has acquired oil leases in northeastern Oklahoma valued at more than \$5,000,000, Arthur H. Bunker, president, has announced.

Climax purchased all the leases formerly held by the Whitehill Oil Corp. of Tulsa, and most of the leases formerly held by the Whitehill family and associates from William J. Sherry of Tulsa, who acquired them from the original owners. The leases cover about 13,500 acres primarily in the Nowata Field. Production by waterflooding is at the approximate rate of 1500 bbl a day from 1500 wells.

The Whitehill Oil Corp. has been liquidated and Climax will operate the properties as the Climax-Brundred Waterflood Division of its oil department, headed by Gay V. Land in New York. L. L. Brundred will be division manager in direct charge of these properties. He will be located in the former Whitehill office in Tulsa.

In the past five years the Climax has diversified, so that it is now mining and milling uranium, vanadium and tungsten, as well as producing oil. The new acquisition will more than double the Climax oil production and represents the third major investment in waterflood properties made by the company.

Gold Bars Expressed by Air

For the first time in the history of Utah mining, an 800-lb (Troy) shipment of gold bullion was flown by air from Salt Lake City to New York. The shipment was made by Utah Copper Division, Kennecott Copper Corp., to a New York customer who had the necessary Government permit to make such a purchase.

New Tailings Pipe Line

Utah Copper Division of the Kennecott Copper Corp. has placed in operation a new "tailings pipeline" at its Magna-Arthur mills, at Magna, Utah. The 12-in. concrete pipe will carry tailings to the northeast section of the division's eight-so mi tailings pond to seal the sides against possible seepage. A number of smaller outlets along the pipeline at the

northeast section of the dike will distribute the fine tailings evenly along the inside of the dike wall.

The project, which started in October, included completion of a pump house at the tailings outlet of the Magna mill.

Uranium on American Board

The nation's first fully listed, independent uranium producer, Continental Uranium, Inc., made its bow on the American Stock Exchange December 21 when 5,000,000 common

shares of that company were admitted to trading and to dealings.

The common stock was originally made available to the public on November 3, 1954, when 500,000 shares were distributed by Van Alstyne, Noel & Co.

According to Gerald Gidwitz, board chairman, the company has almost 13,000 acres under lease in the Colorado plateau section of Utah and is currently operating two producing mines, Continental No. 1 and Rattlesnake near Moab, Utah.



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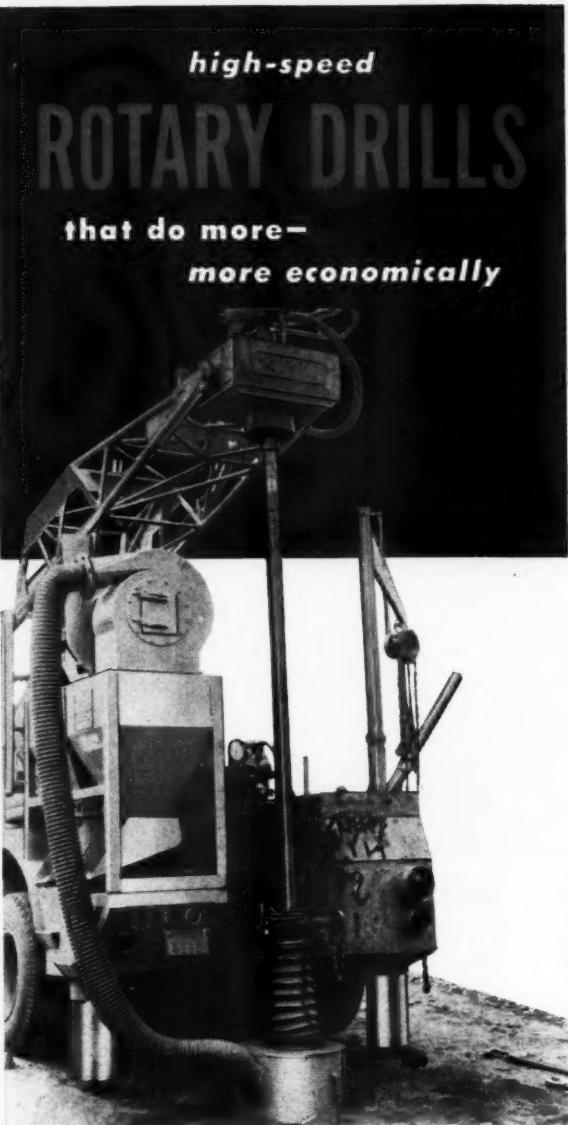
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Plan Gladstone Shaft

Gladstone Mining Co. has announced a new two-compartment shaft will be sunk at their property located in Northern Stevens County, Wash. Property is under lease to A. G. Lotze who plans to sink the new shaft to a depth of about 150 ft and then tunnel out to explore a known ore chimney that has not been mined.

Montana Tungsten Deposit

The Solar Corp. of Spokane has been organized to develop a surface tungsten deposit just south of the old Hope Mine near Phillipsburg, Mont., according to Carl C. Schreiner, vice-president. He reported the company has a hilltop property with an orebody which may be adapted to strip mining methods.

Wyoming Uranium Lease Rates

The Wyoming Land Board has approved new rental rates for uranium leases on state-owned land, according to Land Commissioner John Riedel. The new rate will be 25 cents an acre per year, the same as oil and gas leases. The old rate was \$50 a year per lease up to 1280 acres.

The rate on new leases goes into effect immediately. Rate for existing leases will be increased when the lease has been in effect two years.

To Mine Lithium Ore

The U. S. Lithium Co., a Salt Lake firm, will begin operations soon to mine lepidolite, a lithium bearing mica, from their holdings near Gunnison, Colo., company officials have announced. The ore occurs in a pegmatite dike which, officials said, contains 300,000 tons of lepidolite ore as indicated by surface exploration and diamond drilling.

Alterations are being made in the mill at Gunnison which should be ready to start milling the 8000 tons of ore already on the mine dump soon. The company hopes also to build a plant in about six months to remove lithium salts from the ore in a chemical process.

The new plant will be located in Texas or Denver, officials have said, because of the availability of reagents for the processing of the ore. It will be used to separate lithium salts from the ore and change the chemical structure.

Great amounts of lithium in single deposits are rare, but the material is widespread. This deposit is probably the biggest in the United States. Spodumene is the only other important ore of this rare metal found in the U. S. Most commercial deposits occur in Africa.

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Montana Tungsten Mill

The Pony Tungsten Enterprise Co. has just converted an old mill and is now concentrating scheelite ores from its Strawberry property in Pony, Mont.

Mohave Mill Starts Up

California Mineral Products Corp. has started operation of a new 360-ton per day vacuum-flotation ore processing mill to service the Antelope Valley-Mohave Desert of California. Lead, silver, gold, platinum, tungsten and copper ores are now being milled. The company expects to complete the installation of another unit early this year to permit processing of other ores and minerals according to Hal Corbin, superintendent.

Chewelah Acquires Mill

Chewelah Copper Co. operating a group of claims in Stevens County, Wash., has purchased the former Bonanza Lead mill at Palmer Siding, four miles west of Colville, Wash. The mill is located 28 miles from the mine where a 250-ton ore bin has been constructed.

Ore is taken from the 450-ft level

of the mine where a tunnel is being prepared for steady mining operations, and also from the 500-ft level on the nearby Amazon property, included in the group of claims. Diamond drilling is to start immediately on the 1000-ft level, according to the company.

To Explore Indian Lands

U. S. Indian Service has approved a prospecting permit allowing Sapphire-American Petroleum, Inc., N. Y., to explore for uranium and other minerals on 160,500 acres of Acoma Indian land in New Mexico. The bid carried a bonus of \$101,110, the largest ever offered for prospecting rights on Indian land in the State.

The contract pledges the company to spend at least the same amount in exploration during the first six months of the permit and a similar amount during the second six months, if the permit is not relinquished.

Sapphire-American has the right to prospect on the land for one year and to lease as much land as it wants up to the maximum acreage allowed by the Interior Department. It also can renew the permit for a second year on any 40,000 acres and for a third year on any part of the 40,000 acres.

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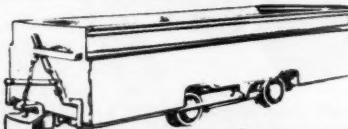
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A Letter to the Editor

AMERICAN Mining Law admirably suits its requirements, and it should not be revised to the ideas of those who do not understand the circumstances of its development.

In general the law should stand as it is, nevertheless, there are features in the law which might be brought to date with a gradual improvement, and effect the required revisions without disturbing the law's general structure.

Present regulations require the filing of Annual Proof of Labor in the Office of the County Recorder to the extent of \$100 worth of work performed for each claim in order to hold title to a mining claim. Such a regulation is proper and should be retained, but all too often the proof of annual labor is filed as required but a follow-up on the claim shows very little work having been done, if any.

An additional requirement should be made to the regulations, as here advocated: That the Locator also be required to post an additional copy of the proof of labor on the claim, at or within 500 feet of the location where the work was performed—such a posting being made for each filing, similar to the requirement for the posting on the claim of the original Location Notice.

The posting of a copy of the proof of labor annually on the ground of a claim, and where the work was performed, would serve to freshen the identity of the claim, and it would also serve to substantiate the evidence and value of the annual work performed for the purpose of holding title to the claim.

Location Notices placed on the ground of a claim can seldom resist a year of weathering. If the written notice is placed in a tin can at the location monument, the rust of the can will obliterate what the gophers don't, and it is only an occasional circumstance wherein the notice can be found, or its information made readable.

By having the evidence of the claim renewed each year by the posting of a copy of the annual proof of labor where the labor was performed, would not only identify the claim by its recent posting, but it would also give notice to all on the ground that such ground was under active title as a mining claim. Such facts are of value to any locator.

If a locator believes his claim to be of value, it is worth identification. The claim name, with the names of its locators, and a description of the work performed should be in evidence to anyone on the ground.

The posting of proof of annual labor in the office of the County Recorder is advisable as it stands for purposes of the record, but the requirement should be enlarged to make it of practical value, otherwise it is a shiftless pro-

cedure giving rise to flagrant violations which are practically impossible to check on the ground by a sincere prospecting locator.

The required change of regulation could be quickly brought into effect, for it is within the right of each State, or even each Mining District, to establish mining regulations for its own government.

Mining regulations can be brought to date by the gradual revision of only those features which have become outmoded, such as the present citation. A radical revision of the law's structure is not required.

NEWTON L. HALL,
San Fernando Bldg.,
Los Angeles 13, Calif.

Editorial Comment

MR. HALL'S communication raises a number of interesting points which might be discussed. However, without going into detail the following comments may be in order.

The General Mining Laws of the United States do require performance of annual labor but do not require filing of proof. Most States have laws providing for the filing of Proof of Annual Labor and make this filing evidence of performance of the work;

but it is the actual performance of the annual labor and not the filing of proof which maintains a claim in good standing.

If it can be shown that the work, as required by the General Mining Laws, has not been performed, an adverse location can be made on the claim involved despite the fact that "proof" of such work has been filed.

Among the various State laws, as an example, Utah requires a person owning a group of claims and doing annual labor for the group at one point to post a notice upon each claim at the discovery monument, stating where such work is being done, and also to post a notice at the entrance of the working where the work is done, stating the names of the claims for which the work is done.

The American Mining Congress has opposed efforts to amend the mining laws to provide for an automatic forfeiture of a claim upon failure to perform the annual labor or to file proof of such labor. There is much to be said for the provision of the mining law which requires an adverse location during a period of default in the performance of annual labor to effect a forfeiture.

The Circuit Court of Appeals, 9th Circuit, has declared invalid an act of

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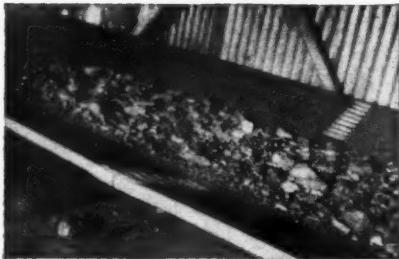


the Alaska Legislature providing that failure to file an affidavit of performance of annual labor would result in abandonment of a mining claim. The Court said the law was invalid because it conflicted with the General Mining Laws of the United States, which give to the owner of a valid mining claim the right to hold and occupy that claim so long as he performs the required annual labor.

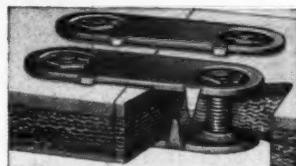
Mr. Hall, apparently, has in mind that failure to post a copy of proof of labor on the claim should permit an adverse location, rather than to effect a forfeiture of the claim.

While many in the mining industry feel that the requirement of annual labor is not complied with in good faith in numerous cases, it is very difficult to establish such failure to comply. These are the things that Mr. Hall undoubtedly has in mind.

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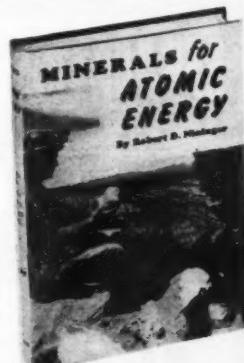
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Nabob and Merger Cooperate

A joint venture of Nabob Silver-Lead Co. and Merger Mines Corp. into the uranium fields of the Colorado Plateau was made known the last of December in letters to stockholders of both companies.

The two Idaho mining firms have taken a 10-year lease and purchase option on 10 full-size mining claims covering the outcropping of a uranium ore deposit in northeastern Utah. It is felt that the deposit has good possibilities of developing into an open-pit operation.

Plans are to start mining from the surface outcrop as soon as weather conditions permit. This work is expected to determine whether or not an open pit operation is feasible and furnish valuable information for a drilling campaign.

N. D. Lignite Production

North Dakota Lignite mines, in the year ending June 30, 1954, produced over 2,750,000 tons of fuel valued at \$6,488,786, according to the annual report of George B. Easton, state mine inspector. The report went on to say that there has not been a fatal accident in the coal mining industry in the state for more than three and a

half years. During this time over 11,000,000 tons of coal were produced.

There are now 75 mines in operation—ten underground and 65 surface operations.

The greatest coal production the state has ever had was in 1951, when 3,280,000 tons of lignite were produced.

Next Mining Show in L. A.

Now that planning for the 1955 Metal Mining-Industrial Minerals Convention in Las Vegas is well under way (see announcement on page 159), the groundwork for the 1956 Mining Show is being laid.

The big, one-in-two-years event will take place in the Shrine Auditorium in Los Angeles, Calif., October 1-4, 1956. Advance indications point to a Convention and Exposition fully as big and successful as the San Francisco meeting last year.

The Shrine Auditorium will have about 150,000 sq ft of exhibit space indoors and in the large parking lot outside and Los Angeles hotels have promised a full quota of accommodations for convention visitors.

Roslyn Coal for Navy

The Department of the Navy has recently contracted for 28,300 tons of coal to be supplied by coal mines at Roslyn, Wash. The coal will be mined by the Northwest Improvement Co. and will be shipped to Korea.

Montana Gold Mill

The Little Rockies Mining & Development Co. has revealed plans to develop gold mining properties in the Little Rockies of Montana to the point where the erection of a mill will be justified. Frank Bryant, president of the company, said a new vein of ore 50 ft wide and at least 200 ft long has been discovered in the Little Ben Mine near Malta. The Little Ben produced \$6,000,000 in gold between 1890 and 1942, when it was abandoned because of WPB order L-208.

Black Bear Active

Black Bear Silver-Lead Mines, Inc., is repairing and improving surface facilities in preparation for resumption of underground development and mining operations in old stopes in the Black Bear mine in the Burke Canyon east of Gem, Idaho. More room has been made on the mine dump and a new portal is being installed. A new roof has been put on the compressor house and the compressor repaired and placed in operating condition. Ventilation equipment is also being overhauled.

Suggestions Pay Off

Consolidated Mining and Smelting Co. of Canada has awarded more than \$600 to 30 Trail and Kimberley employees for suggestions on how to improve operations.

Highest award at Trail was shared by George Clarke and William Sommerfield. They received \$100 for suggesting use of air-powered augers in clearing plugged lines. Kimberley's highest award winner was E. Evans, who received \$125 for improving the design of grizzlies on separator feed chutes in the sink and float plant.

Homestake Completes Shaft

Homestake Mining Co. has completed a three-compartment shaft on the La Sal Mining Co. lease, 32 miles south of Moab, Utah, and is now engaged in cutting stations, it has been reported. The shaft was bottomed at 573 ft.

Homestake also is engaged in drifting on ore at the Little Beaver Mining Co. lease, 3½ miles from the La Sal property. A few truckloads of development ore have been shipped to the government-owned uranium mill at Monticello, Utah. Both the La Sal and Little Beaver are in the Big Indian district of San Juan county.

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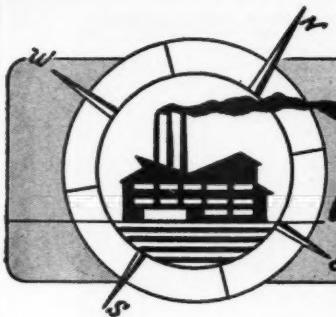
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Manufacturers Forum

Tractor Dozer

The Eimco Corp. announces that its 105 tractor is now available for bulldozer, winch or other attachments. The Eimco 105 tractor was announced about a year ago with a loading attachment. Both loading and bulldozing attachments are Eimco products, but the basic tractor is built to standard SAE mounting dimensions so that any attachment made with standard



SAE drilling will fit the prime mover. The 105 is now equipped with a 120-hp diesel engine with matched torque converter for smooth, balanced power to load requirements. Eimco tractors equipped with bulldozers weigh approximately 18 tons and are available with track widths of 24 in. to provide low ground pressures in soft unstable areas. Both straight and angle bulldozing blades are available for hydraulic operation.

Develop Ore Dressing Reagent

General Mills Special Commodities Division recently announced the availability of Quartec, an industrial grade, natural vegetable colloid. Chemically it belongs to the group known as galactomannan gums.

Researchers at General Mills Laboratories first became interested in guar beans in the late 'thirties and eventually produced the present product, which they believe will improve ore processing efficiency, speed up refining steps, and cut costs.

Quartec has application in both gravity concentration and flotation. In the former, it can be used as a flocculant to increase the settling speed

of slimes and cut the percentage of solids in overflow from thickener tanks. Its use to agglomerate dispersed solids into a flocced slime is reported to step up filtering rates considerably.

In flotation Quartec is reported to be extremely effective as a clay depressant when added to the pulp before addition of the flotation reagent with cost savings of 16 to 40 percent.

This material is stable in high acid media and consequently floes slimes where ores are leached with acid and facilitates settling or filtration.

For further information write Publications Section, Research Laboratories, General Mills, Inc., 2010 E. Hennepin Ave., Minneapolis 13, Minn.

New Electric Plugs

Joy Manufacturing Co., Henry W. Oliver Bldg., Pittsburgh 22, Pa., reports completion of a new line of attachable electrical plugs and receptacles for mining requirements. Named the "Quik-Loc" series because $\frac{1}{4}$ turn couples or uncouples them, they are available for ac or dc applications, from 35 to 450 amp ratings. Factory molded of flame-resistant Neoprene compound and equipped with corrosion-proof couplings or mounting shells, they are watertight, distortion-resistant and shatterproof . . . according to the manufacturer. Plugs consist of two parts . . . the connector head containing contacts and wiring terminals, and a protective Neoprene sleeve that fits over cable/connector juncture. Assemblies are snugly held together by three gear driven ring bands. A new 2-color bulletin, No. B57, provides complete details. Write to Joy in Pittsburgh, care of Department J-6.

Scintillation Counter

A new scintillation counter is now being manufactured and sold by Jeb Instruments of Los Angeles. Called the "Groundaire," the new counter utilizes a jumbo-sized $2\frac{1}{2}$ by $1\frac{1}{2}$ -in. sodium iodide crystal for extreme sensitivity. The instrument is suitable for prospecting from aircraft or moving vehicles. Further information may be obtained from Jeb Instruments, 5060 Hollywood Blvd., Los Angeles 27, Calif.

Mine Shaft Guides

Since its introduction to the American market in the early 1920's by the Mahogany Importing Co., "Bagac," the copyrighted trademark for a selected species of Philippine Apitong,



has won widespread acceptance throughout the United States and Canada for use as mine shaft guides, freight car flooring, platforms, and in other heavy duty construction. Because of its great strength, and resistance to abrasion and splintering, the wood is particularly suited for shaft guides the company reports.

The Timber Engineering Co. of Washington, D. C., recently conducted abrasion tests on "Bagac" in comparison with other woods. The interesting results of this series of studies and tests have been compiled in an illustrated brochure, which is available by writing to the Mahogany Importing Co., 621 South Spring Street, Los Angeles 14, Calif.

Ventilation Tubing

Neolon, Flexible Ventilation Tubing, recently introduced by American Brattice Cloth Corp., Warsaw, Ind., is made

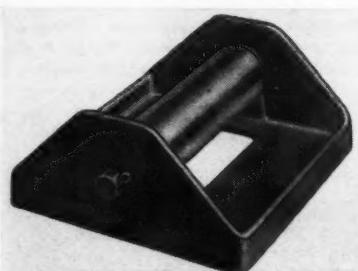


from special neoprene coated nylon fabric. Research and trial installations have established that Neolon tubing will not readily tear, is difficult to puncture, resists acids and oils, is easy to handle because of its comparatively light weight, mildew proof, eas-

ier to inflate than heavier or less flexible tubing material, and is readily rolled up for storage when not in use. It is available in two types of suspension, several types of coupling arrangements and wide range of diameters from 8 to 36 in. Standard fittings such as "T's" and "L's" are available. Further information sent on request to the company.

For Easier Rail Handling

A Rail Dolly made especially for driving up expansion, installing welded rail and changing switch points has been announced by Templeton, Kenly & Co. Essentially a roller mounted on



a low stand, the Dolly is designed for use in pairs to permit the easy movement of rails. Guides on each side of the Dolly stand prevent rails from slipping off and injuring workers. The stand also has cleats on its base to anchor it firmly as it rests on a tie.

Full details are available from the manufacturer, Templeton, Kenly & Co., Gardner Road, Broadview, Ill.

Alloy Steel for Wear Resistance

A new type of alloy steel, with high resistance to impact and abrasion, has been announced by American Steel Foundries, East Chicago, Ind. Known as "Wearpact," this steel has been subjected to extensive field testing in taconite, hematite and copper mining operations.

In brief, "Wearpact" has a tensile strength exceeding 220,000 psi in the normal range of 470-520 Brinell hardness. Yield point exceeds 180,000 psi, making Wearpact highly resistant to flow and distortion. These values are retained at operating temperatures ranging from 450° F. to -50° F. Charpy impact values are approximately 20 ft-lb.

Geiger Counter-Assayer

A portable, lightweight Geiger counter that permits field assay of radioactive substance and gives a timed count is being introduced by Hoffman Laboratories, Inc., Los Angeles.

The counter, called the "Countmaster," weighs just 7½ lb, including probe and shield. An accurate counting range is claimed up to 12,000 counts per minute. The "find" is



Large Grinding Mill for Cement Industry

Photographed prior to shipment from the Milwaukee works of Nordberg Manufacturing Co. is one of the largest grinding mills thus far constructed for the Portland Cement Industry. The mill, which is intended for wet grinding of raw materials, is 9 ft 6 in. inside diameter by 34 ft inside length. It will be driven by 1500 hp, 180 rpm synchronous motor, direct coupled to the mill countershaft. The assembled mill weighed more than 400,000 lb.

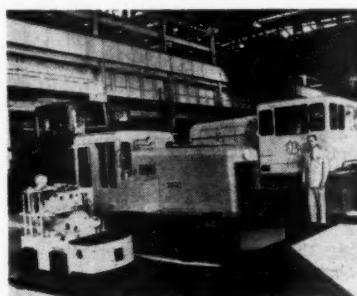
flashed upon four rows of tiny neon lights, where it remains until erased by the operator.

The Countmaster is to be distributed through major mining supply companies and through television distributors already associated with Hoffman Labs' parent company, Hoffman Electronics Corp., in television and radio sales.

New G-E Locomotives

Two small locomotives are now in production at the General Electric Company's Locomotive and Car Equipment Department in Erie, Pa. J. W. Brauns, manager of G. E.'s Industrial Haulage Sales, is shown with the 1½-ton trammer (left) and the 10-ton diesel (center) which are now the company's smallest locomotives.

Designed for both surface and underground hauling, the 1½-ton diesel trammer runs on either 18 or 24-in. gauge track. G-E engineers say that its normal six-ft length can be shortened to four ft for lowering on min-



ing hoist cages. It is only three ft wide and 4½ ft high.

The 10 tonner is produced for industrial plant switching and other surface uses such as in quarries, open-pit mines, salt mines, jute and sugar plantations, and similar applications.

Bin Level Control

An improved type heavy duty "Tellevel" bin level control is now being marketed by Stephens-Adamson Mfg.

Co. of Aurora, Ill. Major changes involve a redesign of switch housing and deflector mechanism to help reduce the possibility of sticky material building up on the unit. The pendant steel cone deflector has been replaced by a steel pyramid. The switch housing is now a one piece unit of spun steel tapped at one end for electrical conduit and sealed at the other end by a molded rubber grommet. Other design features remain unchanged. Standard Duty and Explosion Proof Tellevels are available for lighter service with small lump, granular, and powdered materials.

Internal Backstops

The American Pulley Co. announces that its Shaft-King Speed Reduction Unit is now available from stock equipped with an internal backstop. All sizes, in both 13 to 1 and 20 to 1 ratio, can be so equipped except the two smallest sizes.

The American Shaft-King Internal Backstop is a safety device which operates to prevent backward rotation of the unit when the driving torque is removed. Being internally mounted, the backstop requires no extra space or protective cover.

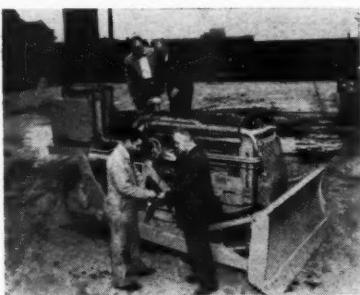
New Line of Uranium Instruments

A complete new line of uranium prospecting instruments, including geiger counters and scintillation counters has been announced by El-Tronics, Inc., Philadelphia electronics manufacturing firm.

Underground Diesel Approved

The U. S. Bureau of Mines has granted approval on the first diesel track-type tractor to be especially designed for safe operation in non-coal underground mining. The machine, a Caterpillar Diesel D4 Tractor equipped with bulldozer, will work in an iron mine near Birmingham, Ala.

Ventilation requirements for each D4 Tractor to work below ground call for a flow of 5000 cfm of fresh air

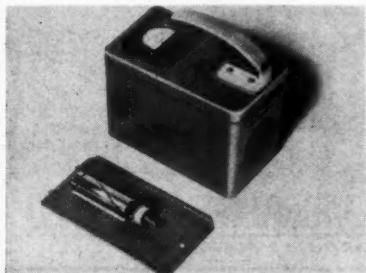


past the machine. These results were obtained from the Bureau of Mines test analyses on the actual raw exhaust gases from the diesel engine under full load, partial load and idle speed conditions.

An especially designed exhaust conditioner, built by the National Mine Service Co., has been installed on the D4 Tractor. This conditioner employs the water cooling principle to reduce exhaust temperatures to below 160° F., as required by Bureau of Mines standards. The conditioner contains no moving parts, is constructed of stainless steel for longer wear and is of large enough capacity to operate a full eight-hour shift without refilling.

Geiger Counter

The Radiac Co., Inc., 489 Fifth Ave., New York 17, announces the availability of the "Tattler," a new type of Geiger Counter for uranium



prospecting. The radiation detector features a self-contained transistor-amplified loudspeaker which enables the user to dispense with earphones.

Additional feature of the Tattler include a removable base plate allowing easy accessibility for Geiger tube replacement. Provision is made for plugging in a hand probe, or a deep-hole probe for drill hole investigation.

Photocopy Paper

Peerless Photo Products, Inc., Shoreham, L. I., N. Y., announces two highly translucent pure rag content photocopy papers: a lightweight 55-gram stock and a transparentized tracing vellum. Both have been extensively field-tested.

Announcements

R. C. Woodward, for the past 20 years chief metallurgist and consulting metallurgist for Bucyrus-Erie Co., South Milwaukee, Wis., has retired from active employment with that company. He has had many years of experience in cable tool drilling problems and now is prepared to offer part time service as a consultant in that field. Woodward's address is 3489 N. Murray Ave., Milwaukee 11, Wis. He may also be contacted through Bucyrus-Erie Co.

John D. Russell, formerly manager of engineering, Joy Mfg. Co., has been appointed vice-president, engineering, of the company, with headquarters at Joy's executive offices in the Oliver Building, Pittsburgh, Pa. Russell has served Joy in various engineering capacities since his graduation, with a degree in electrical engineering, from Cornell University in 1930.



The appointment of W. C. Campbell as general sales manager of National Mine Service Co., has been announced by Gordon MacVean, president. Since 1953 he had been sales assistant to the president, with headquarters in Pittsburgh, Pa.

Establishment of a consolidated sales and service department, effective January 1, for the entire line of Marion-Osgood-General equipment in both the domestic and export markets has been announced by Marion Power Shovel Co.

D. E. Rizor has been named to head the coordinated program as vice-president for sales and service.

The appointment of Paul I. Birchard as vice-president and general manager of Westinghouse Air Brake Company's Le Roi Division in Milwaukee, Wis., was announced recently by Edward O. Boshell, chairman and president of the company.

Birchard will replace Edward J. Green, who has been temporary general manager of the division since the resignation of T. O. Liebscher, former president of the company.

The election of Donald F. Morris as treasurer of the Goodman Mfg. Co., Chicago, has been announced by W. E. Goodman, president. Morris will continue as controller in addition to his new duties as treasurer.

Carl F. Norberg has stepped up to president of the Electric Storage Battery Co. He replaces S. Wyman Rolph, who retired December 31 after 38 years of service.

Chester E. Ault succeeds Andrew K. Kolar as assistant sales manager for Link-Belt Company's plant at 300 W. Pershing Rd., Chicago. Kolar has been named purchasing agent for the same plant which is primarily concerned with the manufacture, fabrication and assembly of materials handling and processing equipment.

CATALOGS AND BULLETINS

LABORATORY FLOTATION MACHINES. Western Machinery Co., 760 Folsom Street, San Francisco 7, Calif. Two Fagergren laboratory flotation machines for research and commercial testing of ores, reagents and pulp mixtures are described and illustrated in Bulletin No. L-1-F-1.

LOCKER ROOM DESIGN. The Moore Company, 1036 Quarrier St., Charleston, W. Va. This is a complete, 40-page study covering the design of change rooms with overhead locker baskets. Standards are set forth for toilet, shower, and locker rooms to insure maximum sanitation, efficiency, and economy. One section of the study furnishes complete details for laying out locker rooms with locker basket. Free copy is available from the above address.

ROTARY BLAST HOLE DRILL. Bulletin 50-R-2 describes the 50-R-2 blasthole drill of Bucyrus-Erie Co., South Milwaukee, Wis. The 50-R is a large rotary drill designed to put down 9½- to 12½-in. diameter holes. It features a heavy-duty crawler mounting, all-steel trussed frame and quick-leveling hydraulic jacks. The booklet offers a complete description of the machine's features along with a list of general specifications.

RUST-OLEUM GENERAL CATALOG. Rust-Oleum Corp., 2799 Oakton Street, Evanston, Ill. The company's 1955 general catalog contains a treatise on rust prevention and is dedicated to showing all types of industry how to stop rust. Featured are 98 color chips of Rust-Oleum products and complete instructions for surface preparation and application.

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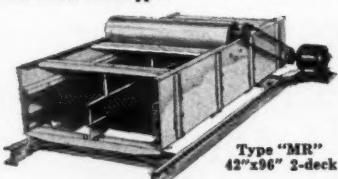
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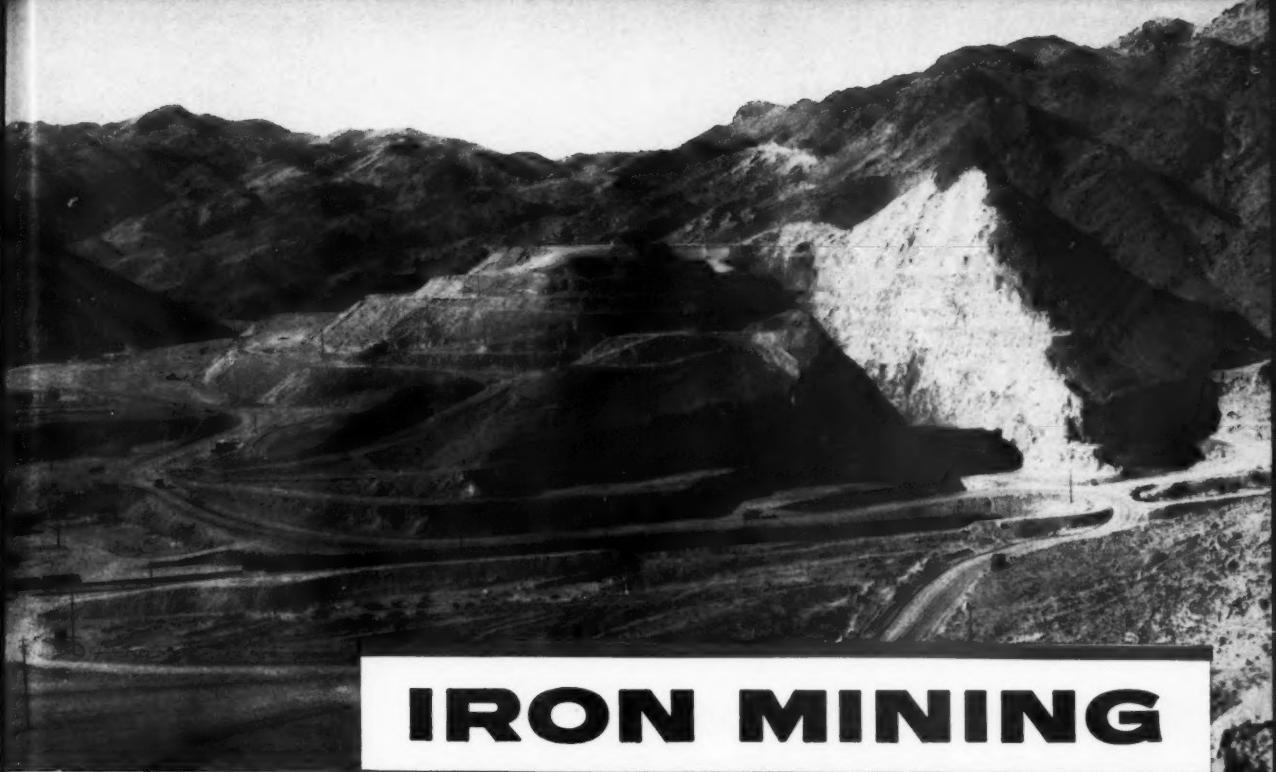
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General view of Kaiser Iron Mine at Eagle Mountain, California.

IRON MINING In California

Kaiser Steel Uses "Eucs"

IRON ORE for the big Kaiser Steel plant at Fontana, California, comes from an open pit mine in the Eagle Mountains between Indio and Blythe. Mining operations began in July of 1948 with 11 Rear-Dump "Eucs" of 15-ton capacity removing overburden, stockpiling low grade material and hauling top grade ore from loading shovels to the main crusher.

Performance of the original Euclid fleet was so dependable and efficient that Kaiser now uses 15 "Eucs" of 22-ton capacity with 5 of the 15-ton units. Loading shovels have 4½ and 5 cu. yd. buckets . . . hauls from bench to crusher have long grades of minus 8%. Despite big loads and steep downhill hauls, speed is controlled without excessive use of the service brakes by means of retarding units that maintain maximum safe travel speeds at all times.

If you have a problem of moving large tonnages on tough off-the-highway hauls, ask your nearby Euclid distributor for helpful facts and figures. He may be able to help you reduce costs, and besides, he's a good man to know!

15-ton "Euc" with quarry body being loaded by 5 cu. yd. shovel.



Dumping 22 tons of ore into crusher for processing and rail shipment to Fontana plant of Kaiser Steel Corporation.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio



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